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Portable Timber Bridges as a Best Management Practice in Forest Management

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Portable Timber Bridges as a Best Management Practice in Forest Management

Edited by:

Edward T. Cesa
Program Coordinator
National Wood In Transportation Program
Northeastern Area, State & Private Forestry
USDA Forest Service
180 Canfield Street
Morgantown, WV 26505

Jeffery Bejune
Forest Products Technologist
National Wood In Transportation Program
Northeastern Area, State & Private Forestry
USDA Forest Service
180 Canfield Street
Morgantown, WV 26505

Melissa Strothers
Editorial Assistant
West Virginia University
School of Journalism
Morgantown, WV 26505

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Acknowledgments

Managing Editor: *Sandra Fosbroke*, Visual Information Specialist, USDA Forest Service

Contributing Authors:

Case Study I:

Steven Taylor, Biosystems Engineering Department, Auburn University, AL

Case Study II:

Curt Hassler, Clear Creek Crossings, LLC, Morgantown, WV 26505

Case Study III:

Justin Perry, New York City Watershed Agricultural Council, Walton, NY 13856
Kevin Brazill, New York City Watershed Agricultural Council, Walton, NY 13856

Case Study IV:

Merv Eriksson, USDA Forest Service, Portland, OR 97208
James Bassel (Retired), USDA Forest Service, San Dimas, CA 91773

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Roxane Palone, Northeastern Area, USDA Forest Service
James P. Wacker, Forest Products Laboratory, USDA Forest Service
David J. Welsch, Northeastern Area, USDA Forest Service
Stephen M. Bratkovich, Northeastern Area, USDA Forest Service

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Executive Summary

This publication provides information on portable timber bridges and the benefits of their use. It serves as a guide to forestry officials and other natural resource managers who have a need for temporary stream-crossing structures and are considering portable timber bridges as a way to minimize soil erosion and sedimentation.

This publication includes design and cost information, installation advice, a list of portable timber bridge manufacturers, and State Best Management Practices (BMPs) that pertain to portable bridge stream crossings. The design information is for informational purposes only. Actual designs should be completed and approved by a registered professional engineer.

Several partners of the USDA Forest Service National Wood In Transportation (WIT) Program have supplied the bridge design information included in this publication.

IMPORTANT

The design information in this publication is provided for informational purposes only. All designs need to be approved by a registered professional engineer prior to use.

Portable bridges are simple, single-span structures; if they are used for multiple spans, users need to involve a registered professional engineer.

There are no American Association of State Highway and Transportation Officials (AASHTO) national design standards for off-highway vehicles (portable bridges). Some Federal agencies, such as the USDA Forest Service, have regional guidelines. Therefore, one goal of this publication is to provide basic information pertaining to portable bridge design and usage that has been stimulated by the National Wood In Transportation Program.

One of the functions of the WIT Program is to foster partnerships that lead to the development and demonstration of simple, dependable, and economical portable timber bridge designs for use in timber harvesting operations and other applications. Additional information on the WIT Program can be found at www.fs.fed.us/na/wit.

Introduction

Those responsible for the management of our forests and other natural resources are finding it more challenging to manage these resources. These challenges are the result of environmental concerns combined with the need to develop cost-effective operational techniques. At the same time, society's demand for wood fiber and other natural resources continues to grow.

Soil erosion and sedimentation caused by the construction and use of roads and trails that access our forests and wilderness areas are major concerns in the management of our natural resources. Forest and land managers, utility companies, construction companies, and other businesses can and have mitigated these issues by implementing Best Management Practices that include the use of portable timber bridges for temporary stream crossings.

Forestry BMP Recommendations

Many forestry Best Management Practices (BMPs) were developed to prevent or minimize the potential adverse effects timber harvesting can have on water quality. Because studies have shown that stream crossings are one of the primary entryways for sediment to enter watercourses (3, 4), it is important that the right structure be properly selected, installed, and maintained. Stream-crossing BMPs provide the operator with this information.

Forests and their related activities contribute only 5 percent of the total suspended sediment, measured in tons, in watercourses in the United States. This compares to 39 percent contributed by cropland. While timber harvesting may alter water quality, the effects are short term and localized (1, 2).

Although the number of BMPs and their provisions for crossing streams differ from State to State, there are a number that are common to most State manuals. The more common stream-crossing BMPs include:

1. Avoiding stream crossings if at all possible.
2. Minimizing the number of stream crossings.
3. Approaching the stream at as gentle a slope as possible.
4. Crossing all streams using a properly designed and installed stream crossing.
5. Crossing the stream at a 90-degree angle.
6. Removing the crossing once the activity is finished.

Other BMPs that reduce stream-crossing impacts include using brush barriers below road fills; putting erosion prevention materials and plants on fills at crossings; covering fills with geotextiles; using geomatrices, temporary wood mats, tire mats, or wood planks to stabilize soil at crossings; and using rock in ditch lines and fords.

Stream-Crossing Structures

When a stream crossing is needed, it is important that the appropriate structure is chosen. Selecting the correct structure is a critical step toward ensuring that the crossing is practical, cost effective, and that soil erosion and sedimentation are minimized. Fords, culverts, and portable bridges are the typical structures used for stream crossings.

A ford is a natural or paved stream crossing where equipment is driven directly through the stream. Stream sections suitable for fords need to be shallow and have low banks and solid streambeds. Fords are sometimes used for crossing streams on haul roads, but they are not acceptable for skid roads or trails. During periods of high water, many fords become impassable.

Culverts are the most commonly used stream-crossing structure. A culvert is usually a large pipe that allows the stream to flow under a road. They can be made of wood, metal, or plastic and can be used on steeper banks than fords. The diameter of the culvert is usually determined by the size of the watershed area. The use of culverts disturbs the stream twice: once during installation and once during removal. Culverts also have the potential to wash out during periods of high water and need to be regularly maintained to avoid blockage.

Portable, temporary bridges make excellent stream-crossing structures. They can span a stream without inhibiting streamflow or aquatic movement and can be installed without extensive soil backfill, thereby reducing the impact on water quality. Timber bridges can be made in an infinite number of lengths and widths, have a variety of carrying capacities, and have a long service life. Although the initial cost of portable bridges might be greater than other stream-crossing structures, the fact that they are reusable significantly reduces their cost per use.

In the past, lower-cost approaches to temporary stream crossings, such as log crossings, fords, and culverts, were preferred over portable bridges because of the relatively high initial cost of portable bridges. However, these low-cost techniques frequently involved the use of large quantities of earth fill in the stream crossing. As a result of the Clean Water Act of 1987, most temporary crossings that required the use of soil fill have fallen into disfavor because they frequently caused erosion, sedimentation, and pollution problems. Because portable bridges can be installed and used with minimal impact on water quality, they have become a more feasible alternative for temporary stream crossings on forest roads.

Benefits and Effectiveness of Portable Timber Bridges

In many situations, portable timber bridges provide an economical, environmentally friendly, and expeditious way to cross a stream.

Portable timber bridges:

- Meet or exceed most BMP guidelines;
- Minimize erosion and stream siltation;
- May reduce permitting time for stream crossings;
- Keep streams clear of debris after installation;
- Are easy to fabricate, or can be purchased prefabricated;
- Are relatively inexpensive to purchase, install, and remove when compared to the cost of a timber sale;
- Are reusable, making them cost competitive with fords and culverts;
- Take less than a day to install, sometimes just a few hours;
- Can be transported easily and safely;
- Eliminate access to property after harvesting is completed;
- Require minimal maintenance; and
- Often are manufactured from locally available timber.

Additional information about temporary stream and wetland crossing options can be found in the publication ***Temporary Stream and Wetland Crossing Options for Forest Management***. This publication can be viewed electronically by visiting the following Web site: http://www.ncrs.fs.fed.us/pubs/gtr/other/gtr-nc202/index.html.

Portable Bridge General Guidelines:

- ✓ **A**lways use a bridge designed and approved by a registered professional engineer that will provide safe access and minimize disturbance to the streambank, channel, and the riparian management zone.

- ✓ **T**he life of a timber bridge will depend on the use, the care taken during transport and installation, and whether it has been treated with preservatives.

- ✓ **I**f the bridge is to be used for more than 1 or 2 years, the timber should be pressure treated with an approved preservative.

- ✓ **P**roper installation of the bridge begins with selecting the appropriate site. It is easier to select the stream crossing before the road layout.

- ✓ **P**lace bridges so they do not constrict stream channels or impede floodwaters.

- ✓ **R**equirements of a suitable crossing site:
  - When possible, use a straight approach.
  - For bridges that are set directly on streambanks, the banks must provide enough bearing length for each side of the bridge.
  - The bridge needs to sit level side-to-side and end-to-end.

- ✓ **I**f possible, do not operate any equipment in the stream during the installation or removal.

- ✓ **A**nchor each bridge panel to prevent it from being washed away during periods of high water.

- ✓ **I**ncreasing the distance between the bridge and the high-water mark reduces the likelihood that the bridge will be affected by rising water levels.

- ✓ **P**roper road construction practices around the stream crossing are essential for preserving water quality.

- ✓ **T**he roadway should be built up to the same elevation as the bridge floor.

- ✓ **M**aterials, such as crushed rock, should be applied to the road surface in close proximity to the bridge to reduce the potential for sediment being washed into the stream.

- ✓ **B**efore each installation, and daily during use, the bridge should be visually inspected. If inspection indicates problems, DO NOT install or use the bridge under any circumstances. Safety is always first.

- ✓ **T**he bridge should always be removed promptly upon completion of a job.

- ✓ **A**lways store the bridge in a supported and stacked condition. An outdoor storage site should be level and reasonably dry. Always provide for airflow if the bridge is covered with a tarp.

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1. Council on Environmental Quality. 1989. Environmental trends. Washington, DC.

2. National Wildlife Federation. 2000. Pollution Paralysis II: Code red for watersheds. Reston, VA.

3. Rothwell, R.L. 1983. Erosion and sediment control at road-stream crossings. Forestry Chronicle (23): 62-66.

4. Swift, L.W. 1985. Forest road design to minimize erosion in the southern Appalachians. *In*: B.G. Blackmon (ed.), Proceedings, Forestry and water quality: A mid-South symposium; Cooperative Extension Service, University of Arkansas: 141-151.

Overview of Case Studies

The case studies presented in this publication detail six portable timber bridge designs. The development of these designs is the result of cooperative efforts between the USDA Forest Service and local partners. The design information in the case studies is provided for informational purposes only. All designs need to be approved by a registered professional engineer prior to use.

Case Study I: The Development and Testing of Glulam Portable Timber Bridges
Auburn University, Department of Agricultural Engineering, Auburn, AL

The objective of this project was to develop timber bridge designs for temporary stream crossings for logging roads and skid trails. Several bridges were fabricated for testing. The bridges were monitored for performance and longevity, and the prototypes were used in a variety of real-world applications. Several structural glued-laminated timber manufacturers have the ability to fabricate these types of portable bridges.

Case Study II: The Development and Testing of Stress-Laminated Portable Timber Bridges
West Virginia University, Morgantown, WV

The objective of this project was similar to the above project, except the bridge design employed stress lamination. A portable bridge was constructed and demonstrated. A business in West Virginia is currently manufacturing this type of bridge.

Case Study III: New York City Watershed Forestry Temporary Bridge Program
Watershed Agricultural Council, Walton, NY

The objective of this project was to encourage the adoption of temporary bridges as a timber harvesting Best Management Practice in the New York City watershed. Emphasis was placed on the development and demonstration of portable timber bridges for use on skidder trails and haul roads. At least three small businesses are currently manufacturing these types of bridges.

Case Study IV: The Development and Testing of Portable Skidder Timber Bridges
USDA Forest Service San Dimas Technology and Development Center, San Dimas, CA

The objective of this project was to design a lightweight and easy-to-install bridge that would aid in minimizing erosion and sedimentation at stream crossings. The USDA Forest Service San Dimas Technology and Development Center (SDTDC) and the National Wood In Transportation (WIT) Program developed a portable/temporary skidder bridge to carry field harvesting equipment over cross drainages. The bridge was used and evaluated by the Homochitto National Forest in Mississippi.

Table 1 presents description, design, and cost information for the portable timber bridges described in these case studies.

Table 1. Portable timber bridge description, design, and cost information.

Case Study	Portable Bridge Type	Dimensions width x length (feet)	Cost	Wood Species Used	Preservative Treatment Used[1]	Design Vehicle
I.	**Longitudinal Glulam Deck Bridge for Truck Traffic**	16 x 30	$15,500	Southern pine	Creosote	American Association of State Highway and Transportation Officials (AASHTO) HS20 truck
I.	**Longitudinal Glulam Deck Bridge for Off-Highway Vehicles**	Two 4 x 26 panels	$8,000	Southern pine	Creosote	35,000-lb wheeled skidder with 10-ft wheel base
I.	**Longitudinal Glulam T-Section Bridge for Truck Traffic**	12 x 35 12 x 40	35 feet = $14,000 40 feet = $17,000	Southern pine	Creosote	AASHTO HS20 truck
II.	**Stress-Laminated Bridge**	12 x 30 12 x 40	30 feet = $9,500 40 feet = $16,000	Southern pine	Chromated Copper Arsenate (CCA)	80,000-lb truckloads & skidders
III.	**Stress-Laminated Skidder Bridge**	Two or Three 4½ x 16 or 4½ x 20 panels	$2,000-$10,000 Average: $2,500	Oak, hard maple, hemlock, and white pine	None[1]	32,000-lb skidder
IV.	**Modular Skidder Timber Bridge**	12 x 16	$1,650 in materials	Red oak	None[1]	27,000-lb axle load, Caterpillar 525 skidder with 8,000-lb grapple hook

[1] If the bridge is to be used for more than 1 or 2 years, the timber should be pressure treated with an approved preservative. The timber should be treated in conformance with American Wood-Preservers' Association (AWPA) C14 (www.awpa.com) and *Best Management Practices for Using Treated Wood in Aquatic and Wetland Environments* (www.wwpinstitute.org). Insofar as is practical, all lumber should be cut, drilled, and completely fabricated prior to pressure treatment.

Case Study I: Portable Glued-Laminated (Glulam) Timber Bridge Designs

Steven Taylor, Professional Engineer
Auburn University, Department of Biosystems Engineering, Auburn, Alabama

Background

The objective of this project was to develop portable glulam timber bridge designs for use on logging roads and skid trails. The portable bridges designed and tested as a result of this project include:

1. Longitudinal Deck Bridge for Truck Traffic
2. Longitudinal Deck Bridge for Off-Highway Vehicles
3. Longitudinal T-Section Bridge for Truck Traffic

1. ***Longitudinal Deck Bridge for Truck Traffic***

Design

The bridge was designed for use by logging trucks and other forestry equipment. However, it was well suited to situations where a temporary bridge was needed for highway vehicles. It had a width of 16 feet and a length of 30 feet (Figure 1). It was recommended that the bridge be installed on a spread footing with the bridge deck extended 2 to 5 feet on either side of the streambanks. Therefore, the bridge had an effective span of approximately 20 to 26 feet. The bridge used four glulam deck panels, each 4 feet wide and 10.5 inches thick. The bridge was constructed of Combination 47 southern pine glulam and all wood components were treated with creosote to a retention level of 194 kg/m^3 (12 lb/ft^3). A wear surface was not installed on the bridge deck; however, steel angles were attached to each end of the bridge to prevent wear from vehicle traffic. Steel tie-down brackets, located on the corners of the bridge, were used to secure the bridge to nearby trees or deadmen. All steel hardware was galvanized.

Portable timber bridges, such as this glulam bridge, make it possible to cross streams with little or no impact. (Photo provided by Steven Taylor)

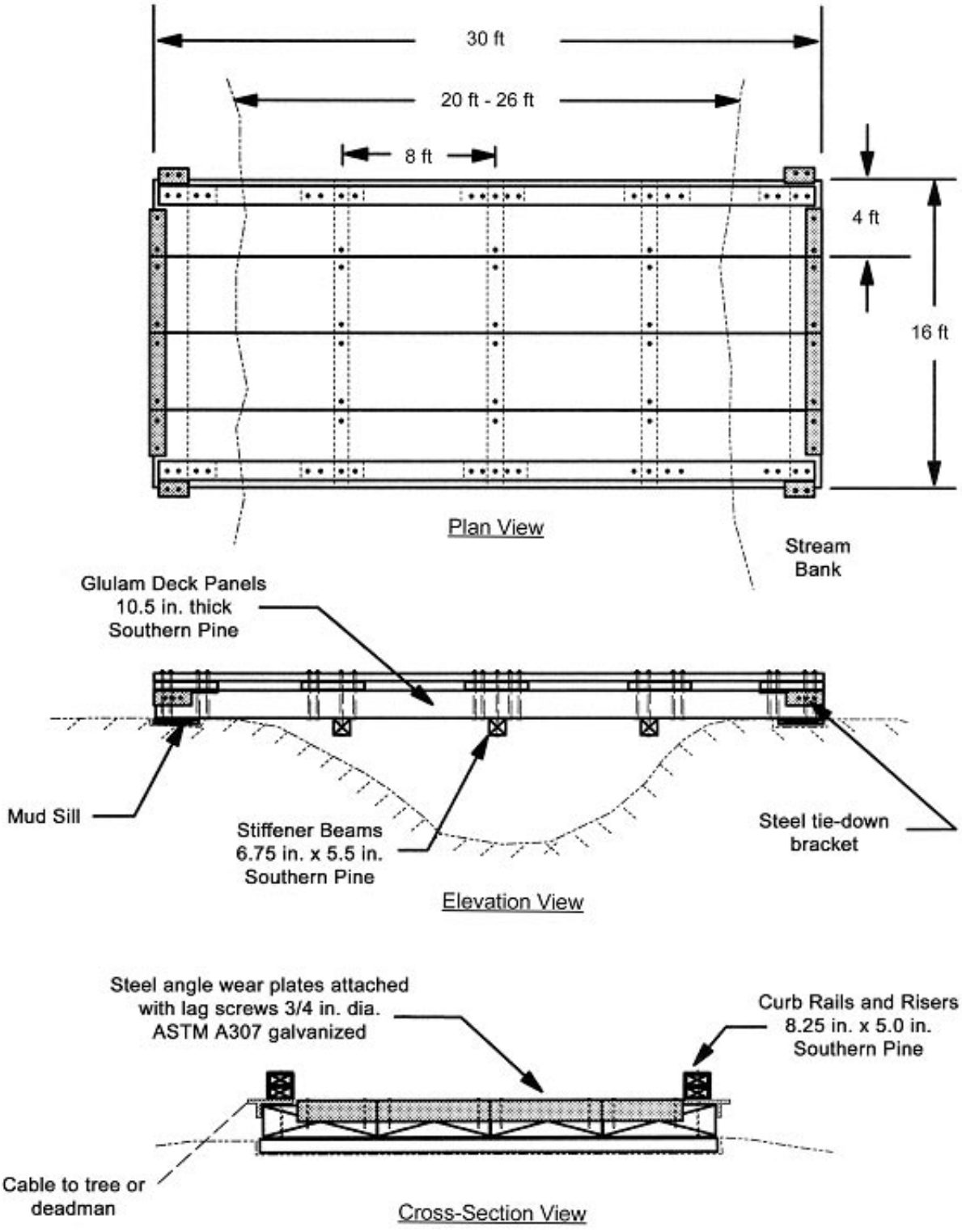


Figure 1. Plan, elevation, and cross-section view of Auburn's longitudinal glulam deck bridge for truck traffic. (Drawings provided by Steven Taylor)

Installation and Removal

Although it was possible to install the deck panels directly on the streambanks, the preferred method of installation was to place a spread footer under each end of the bridge to prevent differential settling of the deck panels. The panels were lifted either by slings or chains attached to eyebolts using such equipment as knuckleboom loaders, excavators, or truck-mounted cranes. The panels could have also been winched into place using a crawler tractor or skidder.

The bridge was installed in less than 6 hours and removed in less than 3 hours using typical forestry and construction equipment. Installation and removal were also accomplished without operating any equipment in the stream or disturbing the stream channel banks.

Portable timber bridge panels can easily be unloaded and installed with common forestry or construction machinery. (Photo provided by Steven Taylor)

Cost

The initial cost of the bridge's components (including the mudsill) was $15,500. The average cost to install and remove the bridge was approximately $1,000 per site. Distributing these costs over 10 sites, the bridge would cost $2,550 per site, making it competitive with permanent culverts and fords. If the bridge were to be used at additional sites, the cost per site would continue to decrease.

Performance

Over the course of the last 10 years, the bridge performed satisfactorily under periodic use in logging operations. It proved easy to install and remove using typical forestry and/or construction equipment. Vehicle traffic did not result in a significant amount of damage to the unprotected deck; therefore, the need for a wear surface was unwarranted. Based on collected water samples, Thompson et al. (3) determined that the bridge installation had no adverse effect on water quality and produced less sediment following storms than a nearby culvert.

Results from static load tests indicated that maximum bridge deflections at mid-span were approximately L/300 at 119 percent of design bending moment. When actual deflection data were compared to those predicted using AASHTO design procedures, there was more apparent load distribution among deck panels than predicted using AASHTO procedures.

2. ***Longitudinal Deck Bridge for Off-Highway Vehicles***

With different portable bridge designs, most any forestry or construction vehicle can be accommodated. (Photo provided by Steven Taylor)

Design

The bridge was designed for off-highway vehicle traffic, such as wheeled log skidders. The design vehicle was a skidder weighing 34,000 pounds with a 10-foot wheelbase. The bridge consisted of two glulam panels, each 4 feet wide, 8.5 inches thick, and 26 feet long, which were not interconnected (Figure 2). It was constructed of Combination 48 southern pine and treated with creosote to a retention level of 194 kg/m^3 (12 lb/ft^3). Because this bridge was projected to have a service life of 10 years, the steel hardware on the test bridge was not galvanized. Instead, a primer coat of paint was applied to all steel hardware after installation.

Installation and Removal

There were two methods of installation. In one method, a skidder's grapple was used to pick up each panel, back the panel into place across the stream, and then lower the panel directly on the streambanks. Another installation method involved winching the panels into place with a skidder or crawler tractor. A gap was left between the panels so that the wheel line of the skidder matched the centerline of each panel. Logs were placed between the panels to prevent excessive debris from falling into the stream during skidding operations.

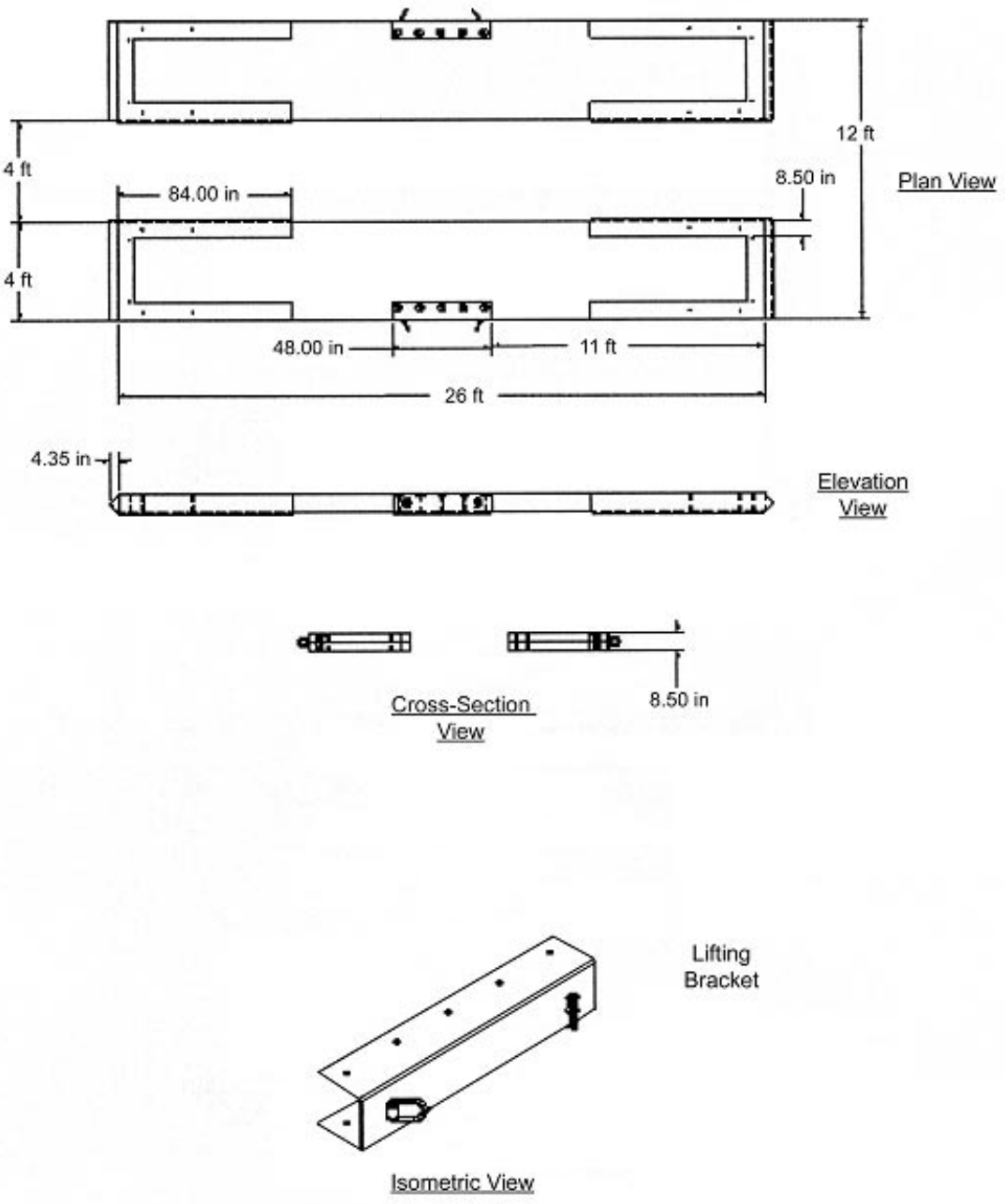


Figure 2. Plan, elevation, cross-section, and isometric view of Auburn's longitudinal glulam skidder bridge. (Drawings provided by Steven Taylor)

Research by Veal reported on a long-term study to quantify water quality impacts from a portable skidder bridge crossing (4). Her results showed that this bridge could be installed, used, and removed with little impact on stream water quality. During installation and removal of the bridge, only 0.5 kg and 0.2 kg of sediment, respectively, were added to the streamflow at the bridge site. Over a 1-year period of bridge use, approximately 130 kg of sediment were introduced into the stream at the bridge crossing.

The bridge has been installed and removed in 2 hours. This included the time needed to skid the bridge panels to the stream-crossing site, position the bridge panels, place logs between the panels, remove the panels and logs, and skid the panels back to the loading area. If needed, one person could install the bridge.

A deck panel is moved in place by a grapple skidder. (Photo provided by Steven Taylor)

Cost

The initial cost of constructing the finished prototype glulam panels was $9,300. Its current estimated cost is $8,000. This estimate includes the cost of preservative treatment, installation of steel hardware, and delivery to the job site. Installation and removal costs were estimated at approximately $165 per site. Therefore, if the bridge was installed at 50 different sites, the cost would be $325 per site.

Performance

The bridge performed well in service. Deflection was hardly noticeable to skidder operators driving across the bridge. Additional steel plates were added along the side of the deck to prevent some superficial damage that had been occurring during its installation. Although the bridge did not include an additional wear surface, the deck panels performed well. Skidder operators commented that they preferred portable timber bridges to steel bridges because the timber deck was not as slick when wet or muddy. Overall, the bridges were well received by forest landowners and loggers for their easy installation and removal and the fact that they reduced the environmental impact of the stream crossing.

3. *Longitudinal T-Section Bridge for Truck Traffic*

Design

This bridge was designed to carry log trucks and other forestry equipment for timber harvesting operations over a longer span than the previous two bridge designs. To achieve longer spans, the bridge design incorporated two non-interconnected panels fabricated in a unique double-tee cross section (Figure 3). The cross section consisted of a vertically laminated flange on top of the module with two horizontally laminated webs underneath the flange (Figure 4). The vertically laminated flanges were fabricated using nominal 2-inch by 8-inch lumber and were considered a Combination 48 southern pine glulam panel. The webs were fabricated using nominal 2-inch by 12-inch southern pine lumber suitable for use as tension laminations in typical glued-laminated timber beams.

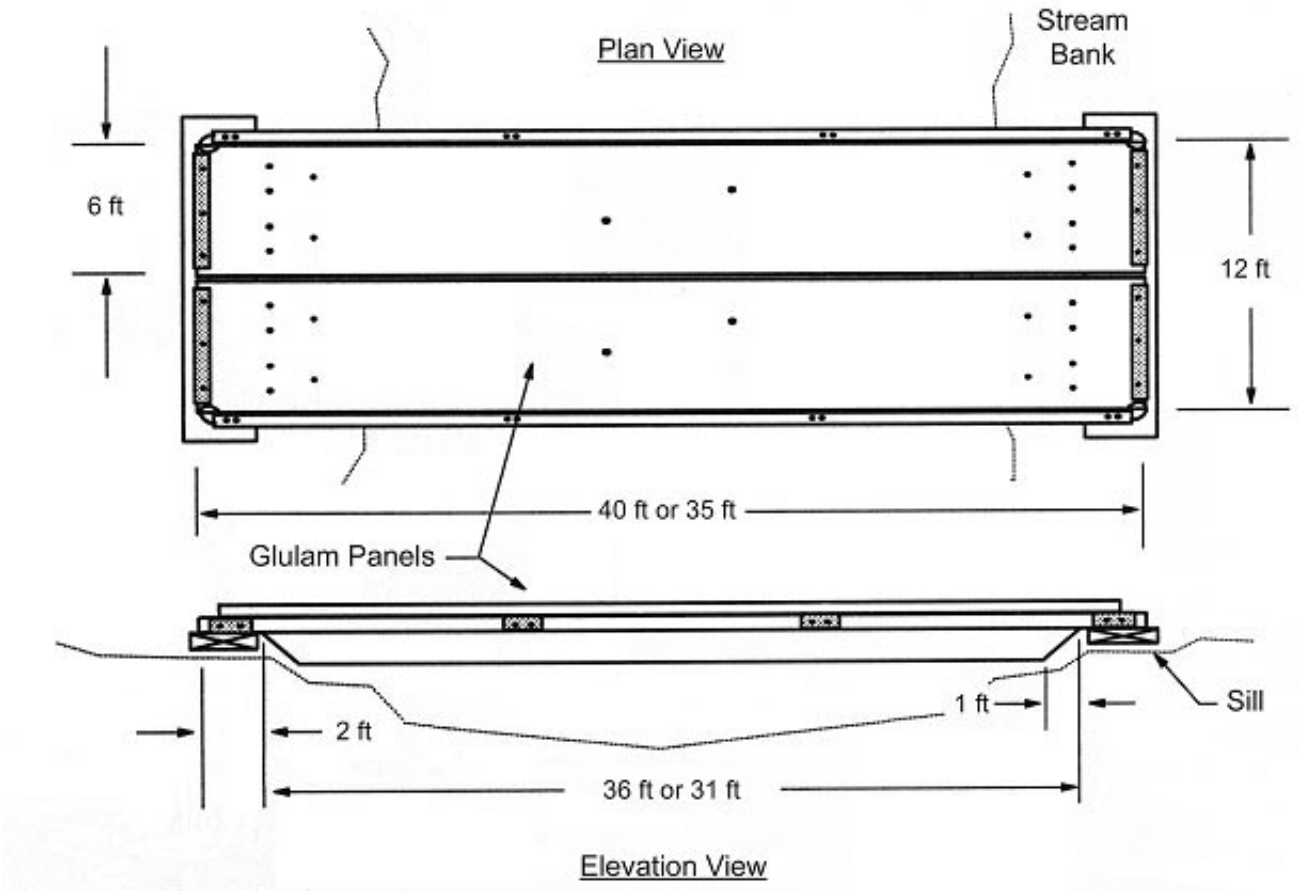


Figure 3. Plan and elevation view of Auburn's longitudinal glulam T-Section bridge for truck traffic. (Drawings provided by Steven Taylor)

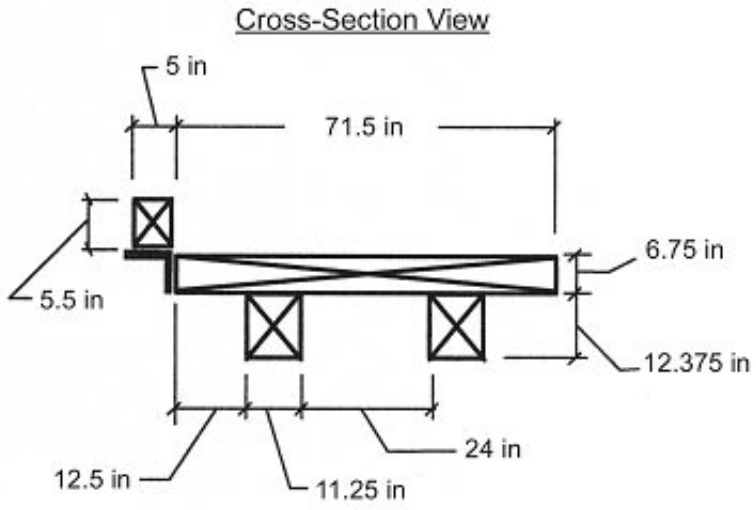


Figure 4. Cross-section view of Auburn's longitudinal glulam T-Section bridge for truck traffic. (Drawing provided by Steven Taylor)

This type of bridge is well suited for log truck traffic.
(Photo provided by Steven Taylor)

Two bridges were constructed using this design. The first bridge consisted of two longitudinal panels 40 feet long and 6 feet wide, giving the total bridge a width of approximately 12 feet. The second bridge was identical in width to the first bridge; however, it was 35 feet long.

The panels were designed to sit on spread footings, which were placed directly on the streambanks. The panels were not interconnected; therefore, each panel was assumed to carry one wheel line of the design vehicle. At the ends of the bridge panels, the flange extended 2 feet beyond the end of the webs. The extension of the flange was intended to facilitate the placement of the bridge panel on the spread footings.

To facilitate lifting of the bridge panels, lifting eyes were placed 3 feet on either side of the bridge panel midspan. The lifting eyes allowed a chain or wire rope to be fed down through one eye and back up through the other eye to form a sling, which could be attached to a shackle or hook on a crane, loader, or excavator.

A wearing surface was not specified in the bridge design. However, steel angles were attached to the top face of the flange at each end of the bridge to prevent damage as vehicles drove onto the bridge. In addition, 0.25-inch thick steel plates were attached to each web to prevent damage during installation. A primer coat of paint was applied to the steel hardware before installation. Both bridges were treated with creosote to a retention level of 194 kg/m^3 (12 lb/ft^3) in accordance with American Wood-Preservers' Association (AWPA) Standard C14 (1).

Installation and Removal

The two bridges were installed using different methods.

Before the 40-foot bridge was installed, spread footings were prefabricated. The footings consisted of sills that were 30 inches wide and 16 feet long. They were constructed from nominal 6-inch by 6-inch chromated copper arsenate (CCA) treated southern pine timbers and bolted together with ¾-inch bolts.

A typical installation began by clearing the road approach to one side of the stream crossing with a crawler tractor. The bridge deck panels were unloaded and transported to the staging area using an excavator. The excavator was then used to level both streambanks and place the sill on the far side of the stream. The excavator then carried each panel to the stream and set them in place across the stream. After both panels were put in place with the excavator, the second sill was pushed under the bridge panel end on the near side of the creek. Wire ropes were then used to secure the bridge corners to nearby trees to prevent movement in the event of flooding. In total, clearing the streambanks and placing the bridge panels took approximately 2 hours. Removal of the bridge was accomplished in a manner similar to the installation.

Installing a bridge panel using an excavator.
(Photo provided by Steven Taylor)

Prior to installation of the 35-foot bridge, sills similar to those made for the first bridge were constructed for spread footings. The bridge panels were pulled to the stream-crossing site using a crawler tractor and the first panel was positioned as close as possible to the streambank. Then the tractor was positioned behind the panel and small logs were placed on the ground in front of the panel (perpendicular to the direction of travel). A small log approximately 15 feet long was placed on the opposite streambank (parallel to the direction of travel) with its base in the stream channel and its top near the top of the streambank. The tractor then pushed the panel toward the stream channel. The logs laying perpendicular to the panel were used to help the bridge panel roll toward the stream crossing. Once the forward end of the panel tipped downward into the stream channel, the panel slid up the log laying parallel to the panel. At this point, workers attached a chain to the ends of each panel and to the blade on the crawler tractor. Then the tractor

picked up the panels and made final adjustments in their position. After the panels were in place, the sills were pushed under the panel ends by the crawler tractor. Wire ropes were then used to secure the chain loops on the bridge's corners to nearby trees. The total time to install the bridge was 3 hours. The removal of the bridge was accomplished by reversing the individual steps of the installation.

Installing a portable timber bridge with a tractor.
(Photo provided by Steven Taylor)

Cost

It cost approximately $17,000 to manufacture the 40-foot bridge in 1996. This included the cost of materials, fabrication, preservative treatment, and shipping. The cost for the spread footings was an additional $600. The average cost of the labor and equipment needed to install and remove the bridge was $1,000. This cost included $540 for the excavator, $300 for trucking costs, and $160 for additional labor. Therefore, the total cost to install this bridge one time was $18,600. It was projected that the total cost to install and remove the bridge at 10 different sites would be $10,000. When this estimate is added to the initial cost of the bridge and mudsills, the total cost of the bridge system for 10 sites comes to $27,600, or $2,760 per site.

Approximately $14,000 was needed to manufacture the 35-foot bridge. This included the cost of materials, fabrication, preservative treatment, and shipping. The sills, cable, and associated hardware cost an additional $825. Approximately $1,095 in equipment and labor was needed to install and remove the bridge. Therefore, the total cost to install and remove this bridge for the first time was $15,920. The projected total cost to install and remove the bridge at 10 different sites was approximately $10,950. When this estimate is added to the initial cost of the bridge and the sills, the estimated total cost of the bridge system for 10 sites comes to $25,775, or $2,578 per site.

Performance

When handled properly, the bridges performed well with minimal damage. Test results indicated that the T-section glulam decks exhibited linear elastic behavior and acceptable levels of deflection. Both bridges exhibited checking; however, this did not appear to have significantly affected the structural adequacy. Alternative fabrication techniques would probably eliminate this concern.

Conclusions

Based upon testing of the three portable longitudinal glulam bridges, Taylor et al. (2) made the following conclusions:

1. It is feasible and practical to construct portable timber bridges.
2. Installation of the bridges can be easily accomplished using common construction or forestry equipment.
3. There was minimal disturbance of the stream channel or streambanks; therefore, there were minimal water quality impacts during construction activities.
4. Installation times ranged from 1 hour to 6 hours.
5. Total project costs (including the initial costs and installation and removal costs) of the bridges if they were used at 10 different sites ranged from $965 to $2,760 per site [in these case studies only], which is competitive with other traditional stream-crossing structures on similar size streams.
6. For longer span portable bridges, the T-section glulam deck is a promising bridge alternative.
7. Results from load tests indicated that all bridges exhibited acceptable levels of deflection.
8. Minor damage to the bridge components occurred during installation and removal activities. However, the damage apparently has not reduced the structural adequacy of the bridge components.

For more information, contact:

Steven E. Taylor, P.E.
Biosystems Engineering Department
214 Tom E. Corley Building
Auburn University, AL 36849-5417
Phone: 334-844-3534
FAX: 334-844-3530
Web site: www.eng.auburn.edu/users/staylor/timber_bridges.html

References

1. American Wood-Preservers' Association. 1991. Standards. American Wood-Preservers' Association, Woodstock, MD. 220 pp.

2. Taylor, S.E., M.A. Ritter, K.P. Keliher, and J.D. Thompson. 1996. Portable glulam timber bridge systems. *In*: V.K.A. Gopu (ed.), Proceedings of the 4th international wood engineering conference; 1996 October 28-31; New Orleans, LA. Baton Rouge, LA; Louisiana State University; Vol. 2.: 368-375.

3. Thompson, J.D., S.E. Taylor, K.H. Yoo, R.W. Brinker, and R.A. Tufts. 1995. Water quality impacts of different forest road stream crossings. *In*: Proceedings of the 18th annual meeting of the Council on Forest Engineering; N.C. State University: 68-76.

4. Veal, L.M. 2002. Life-cycle water quality impacts from a temporary bridge stream crossing and its road approaches. M.S. Thesis, Auburn University. 183 pp.

Case Study II: Stress-Laminated Portable Timber Bridge Design

Curt Hassler, Currently Member, Clear Creek Crossings, LLC,
and Formerly Leader, Appalachian Hardwood Center
West Virginia University, Morgantown, West Virginia

Portable timber bridge in use. (Photo provided by Clear Creek Crossings, LLC)

Background

In the early 1990s, a partnership was formed among the West Virginia State Division of Forestry; USDA Forest Service; West Virginia University, Division of Forestry, Appalachian Hardwood Center; and a number of private companies in an effort to develop and demonstrate a simple, dependable, and economical portable timber bridge for timber harvesting operations. The stress-laminated bridges that evolved from this collaboration have been marketed and sold by a private West Virginia company under U.S. Patent No. 5,603,134.

Design

The bridge was originally designed to accommodate maximum legal truckloads (40 tons). However, because of its proven durability, it has also been used as a skidder bridge. The bridge was fabricated in 30- and 40-foot lengths. Each bridge consisted of two 6-foot wide modules that were joined at the installation site (Figure 5). Each module of the 30-foot bridge was constructed of 2-inch by 10-inch No. 2 southern pine and longitudinally stress laminated using high-tensile threaded steel rods (Figure 6). The 40-foot bridge was similar to the 30-foot bridge, except 2-inch by 12-inch No.1 southern pine was used. On the exterior of each module was a 6-inch by 6-inch high curb. The wood was treated with chromated copper arsenate (CCA) to a retention level of 0.4 pounds per cubic foot (pcf).

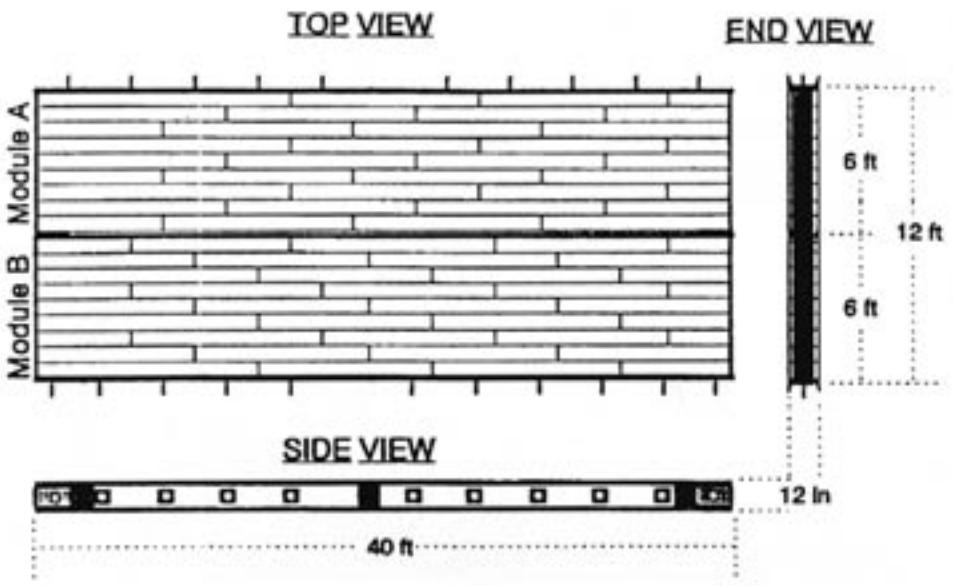


Figure 5. Standard WVU modular stress-laminated timber bridge design (number of laminates and location of butt joints are not representative of actual design). (Figure provided by the WVU Division of Forestry)

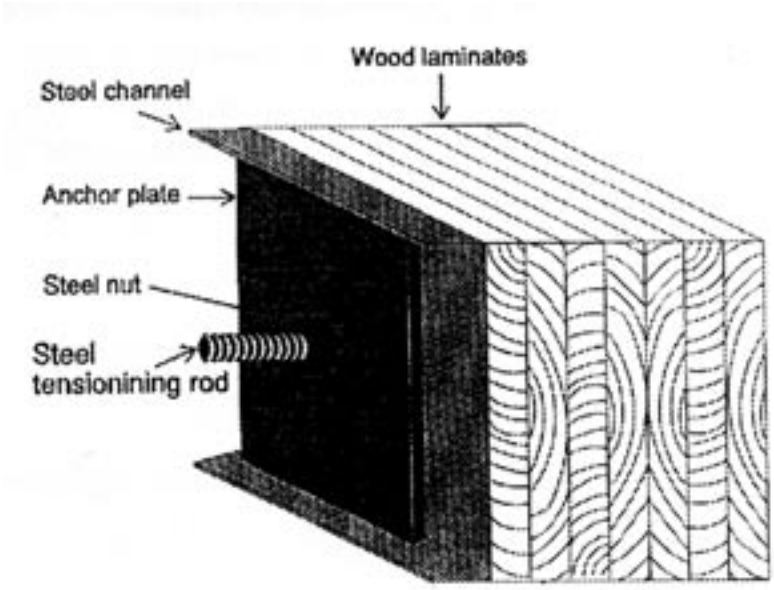


Figure 6. Steel channel, anchor plates, and tensioning rods used on WVU-designed stress-laminated timber bridges. (Figure provided by the WVU Division of Forestry)

Installation and Removal

Proper installation began by selecting the appropriate stream-crossing site. Table 2 lists the six critical requirements of a stream-crossing site that were assessed prior to the bridge being installed.

Table 2. Six critical site requirements for the WVU stress-laminated bridge.

Crossing Attribute	Requirements
Bank Height	Minimum of 2 feet from bottom of bridge deck to streambed
Bridge Span	Maximum of: 20 feet for 30-foot bridge 30 feet for 40-foot bridge
Bearing Length	Minimum of 5 feet on each end of bridge
Approach Alignment	Parallel to bridge length for a minimum of 1½ truck lengths
Approach Grade	Maximum of 10 percent grade
Bridge Grade	Maximum of 2 percent end to end Bridge must be level side to side

Once the site was selected, all vegetation was cleared and the approach was graded. If stone was used for approaches or bank stabilization, the work was completed before the bridge was installed.

When loading or unloading the bridge modules, it was important to know that the equipment, chains, and cables being used were capable of handling the weight. Each module of a 30-foot bridge weighed approximately 4 tons and each 40-foot module weighed approximately 6 tons.

The bridge was installed directly on the banks of most streams using several different methods. The installation took about an hour, but could vary depending on the site, site preparation, and available equipment.

Installed stress-laminated portable bridge.
(Photo provided by Clear Creek Crossings, LLC)

Standard Method of Installation

The first bridge module was unloaded and skidded to the stream crossing. The module was then winched across the stream by a properly equipped log skidder or bulldozer positioned on the other side of the stream. The second module was then winched across the stream, using the first module as a bridge. The second module was positioned adjacent to the first and connected using end connector bolts.

Combined Unloading/Installation Method

This method allowed the bridge modules to be installed directly over the stream during unloading, provided a properly sized log loader could be positioned at the stream crossing. The truck carrying the bridge modules backed up to the stream crossing and a log skidder or bulldozer, equipped with a winch, was positioned on the opposite streambank facing away from the truck. Using a log loader grapple, the front of the top module was lifted by an attached cable or chain and winched from the trailer. As the module's balance point shifted and the necessary adjustments were made, the truck was driven from underneath the module. Once the module was lowered to the ground, it was winched across the stream with the log skidder or bulldozer. The second module was then lowered to the ground as described above, but winched across the stream using the first module as a bridge.

Deck-Facilitated Stream Crossing Installation Method

In cases where machinery may not cross a stream during installation due to environmental regulations or stream conditions, this installation method was most appropriate. A single bridge module was pushed lengthwise onto the opposite streambank with a log skidder or bulldozer blade. Then a log skidder or bulldozer traversed the tilted deck module to cross the stream. Once on the other side of the bridge, the skidder or bulldozer lifted and winched the deck onto the streambank. The second module was then winched over the stream using the first module as a bridge.

Optional Portable Abutments

Optional portable abutments were used in situations where adequate end support could not be provided when bridge modules were placed directly on the streambanks. Low and unstable banks, stream fords, or long stream crossings that did not provide adequate bearing length were just some of the conditions that warranted their use. The abutments were designed to directly support the bridge without bearing on the streambanks. The stream-crossing site was prepared by leveling the stream bottom with crushed stone to provide a firm and level base of support. Typical logging or construction machinery was used to unload and position the abutments. Once in place, the abutments were checked to ensure they provided the required bearing length and were level in both directions (both parallel and perpendicular to the stream crossing). The bridge modules were installed using the same methods previously described and secured to the abutments with lag screws.

The bridge was promptly removed upon completion of a job by reversing the instructions of the installation and unloading methods.

Cost

The costs (using 2003 prices) for the 30- and 40-foot bridges were $9,500 and $16,000, respectively.

Performance

The earliest bridges were introduced into logging applications in the early 1990s and still remain serviceable after having been installed over 30 times. The design, fabrication, and installation of the bridges were accomplished without any significant problems and the bridges continue to be used for numerous applications. As confirmed by cooperators who purchased the bridges, their advantages continue to be the ease of installation, reusability, durability, and economic and technical feasibility.

Basic design information on stress-laminated timber bridge superstructures can be obtained from the USDA Forest Service publication *Standard Plans for Timber Bridge Superstructures* (publication number WIT-02-0060). Printed copies are distributed by the National Wood In Transportation Information Center or the publication can be downloaded from the National Wood In Transportation Web site (www.fs.fed.us/na/wit) under "Publications."

National Wood In Transportation Information Center
180 Canfield Street
Morgantown, WV 26505
Phone: 304-285-1591
FAX: 304-285-1587
Web site: www.fs.fed.us/na/wit

For more information, contact:

Clear Creek Crossings, LLC
2337 Stewartstown Road
Morgantown, WV 26508
Phone: 304-292-5417 or 304-276-0946
FAX: 304-291-3482
E-mail: curth@mail.wvnet.com or tlpahl@westvirginia.com

Case Study III: New York City Watershed Forestry Temporary Bridge Program

Justin Perry, Formerly Watershed Program Forester
Kevin Brazill, Forestry Program Manager
Watershed Agricultural Council, Walton, New York

Portable skidder bridge used for harvesting operations in the New York City watershed. (Photo provided by Watershed Agricultural Council staff)

Background

The New York City (NYC) Watershed Forestry Temporary Bridge Program was created to help loggers maintain water quality while harvesting timber in the NYC watershed. The program developed a portable timber bridge design that was economical and easy to fabricate. The bridges built using this design were demonstrated on skidder trails and haul roads.

Design

The bridge was designed to carry a 32,000-pound skidder over a 14-foot clear span. The bridge consisted of two or three modules, each 4½ feet wide and either 16 or 20 feet long (Figure 7). The ends of the modules were staggered and beveled to grip the bank and lie flat. Larger hardwood timbers, such as oak and hard maple, were used in the center and on the outside edges to provide strength (Figure 8). Softwood timbers, such as hemlock and white pine, were alternated to reduce weight. Any knots were staggered during fabrication. The test bridges were not treated with preservative, but treatment is recommended for bridges that are to be used for one or more years.

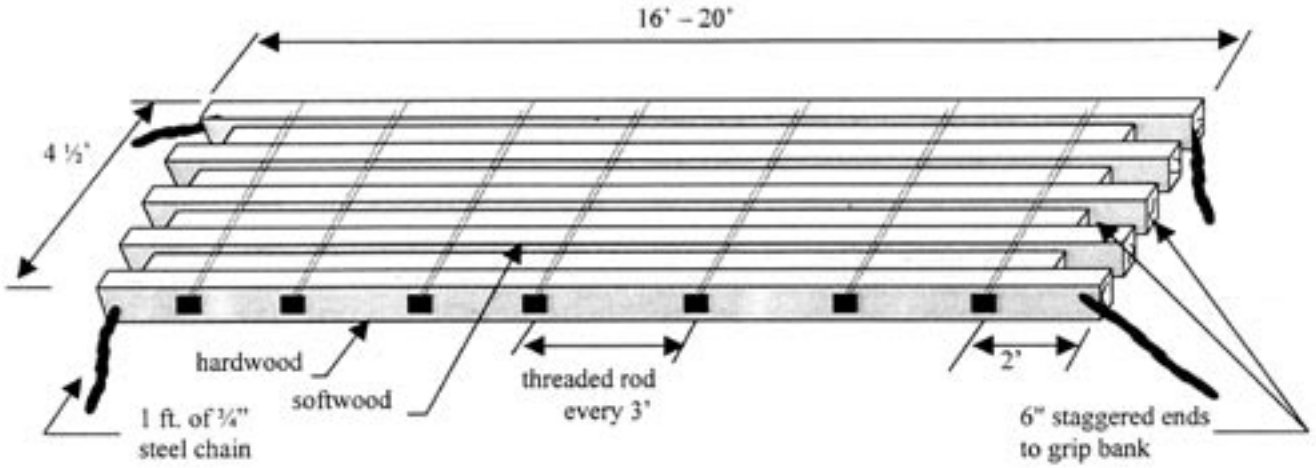


Figure 7. Plan view of a stress-laminated portable timber bridge segment constructed by the NYC Watershed Forestry Temporary Bridge Program.

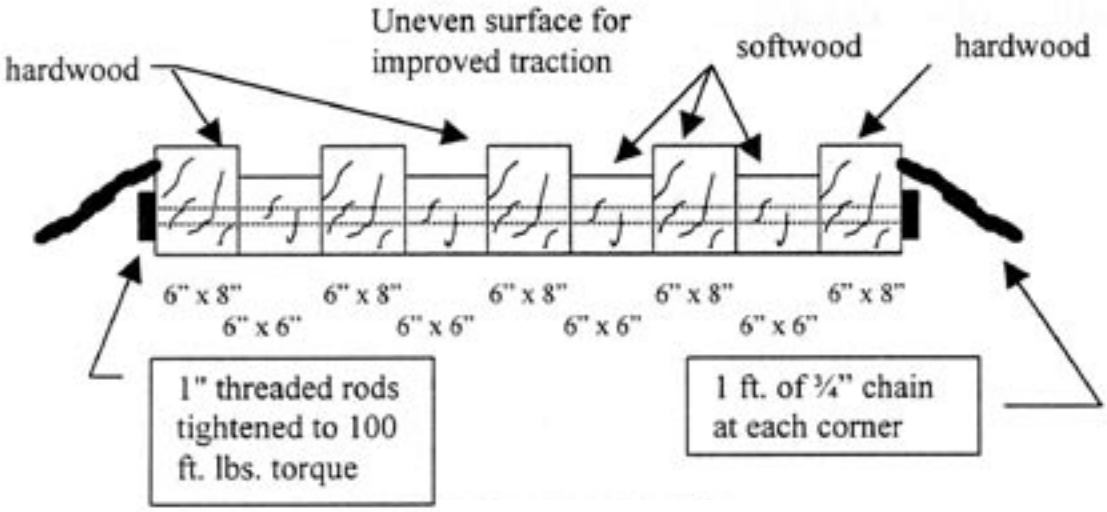
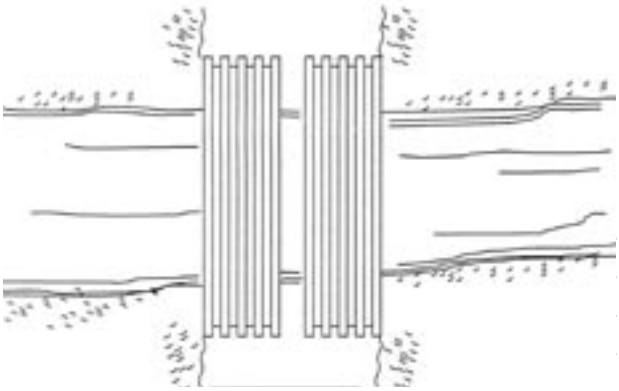


Figure 8. End view of a stress-laminated portable timber bridge segment fabricated by the NYC Watershed Forestry Temporary Bridge Program.

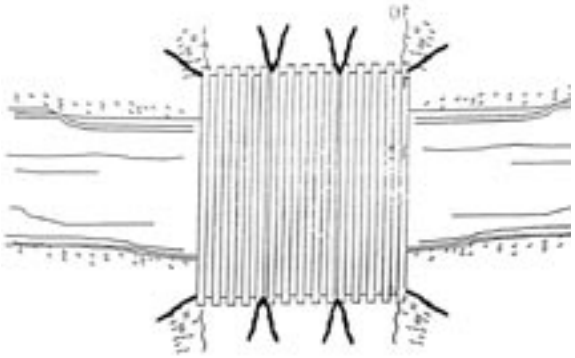
Installation and Removal

Chains were used on the panel corners to skid the sections from the landing and to hold the bridge modules together (Figure 9). Proper installation also included leveling of the bridge and ensuring that enough clearance was provided. It is important that the bridge is sufficiently long enough so that a few feet are sitting on each bank. This helps prevent bridges that are barely long enough for the crossing from sinking into a wet or soft bank.



TOP VIEW

(a)



TOP VIEW
3-Segment Bridge Assembly
(Width of center segment may be varied to accommodate equipment and load width requirements)

(b)

Figure 9. Top view of the installation of (a) 2-segment and (b) 3-segment stress-laminated portable bridges fabricated by the NYC Watershed Forestry Temporary Bridge Program.

Cost

The average cost of the demonstration bridges was $2,500 and ranged from $2,000 to $10,000.

Performance

The life expectancy of the skidder bridge depended on the use and exposure of the bridge to moisture. The average lifespan of the bridge was 4 to 5 years with estimates ranging from 2 to 6 years. The bridge's life span could be reduced to 2 years with heavy use or storage in moist conditions. As beams dried, the bolts needed to be re-torqued. In addition, the bolts needed to be inspected monthly during the first year.

For more information, contact:

Watershed Forestry Program
Watershed Agricultural Council
33195 State Highway 10
Walton, NY 13856
Phone: 607-865-7790
FAX: 607-865-4932
E-mail: forest@catskill.net
Web site: www.nycwatershed.org

The bridges were based on a design originally reported in the following publications:

Kittredge, D.B. and C. Woodall. 1997. Use of portable skidder bridges in western Massachusetts. The Northern Logger 46(4): 26-27, 36.

Kittredge, D.B., C. Woodall, and A.M. Kittredge. 1997. Portable skidder bridge fact sheet. University of Massachusetts Cooperative Extension. Amherst, MA.

Case Study IV: Portable Skidder Timber Bridge Design

Merv Eriksson, Professional Engineer, USDA Forest Service
James Bassel (Retired)
USDA Forest Service San Dimas Technology and Development Center, California

Skidder bridge used for harvesting operations in the Homochitto National Forest, Mississippi. (Photo provided by Homochitto National Forest staff)

Background

A lightweight and easy-to-install bridge was needed to minimize erosion and sedimentation caused by stream crossings in the Homochitto National Forest in Mississippi. The USDA Forest Service San Dimas Technology and Development Center (SDTDC) and the Wood In Transportation (WIT) Program partnered to develop such a portable/temporary skidder bridge design.

Design

These bridges were designed to carry a 27,000-pound axle load, which equates to a Caterpillar 525 skidder with an 8,000-pound grapple load. The bridges were 16 feet long and 12 feet wide. They were fabricated using three 4-foot wide preconstructed laminated panels using 4-inch thick by 8-inch wide timbers (Figure 10). The test bridges were constructed of red oak. Any species may have been used provided that its tabulated, or unadjusted, allowable bending stress was not less than 875 pounds per square inch. The exterior panels had 8-inch by 8-inch curbs, thereby making the travel width 10 feet 8 inches. The test bridges were not treated with preservative, but treatment is recommended for any timber bridge that will be put into service for any extended period of time.

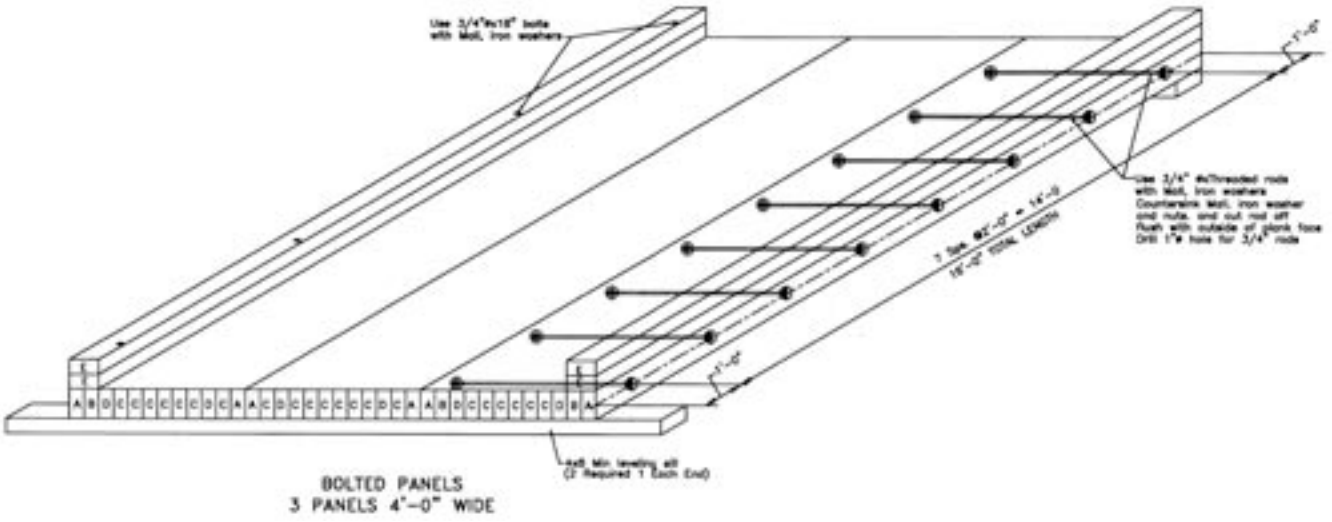


Figure 10. Drawing of a stress-laminated portable bridge designed by the San Dimas Technology and Development Center.

Fabrication

The bridge panels could be prefabricated or assembled in place. Two people could assemble the panels in 2 days. Panel fabrication consisted of bolting, nailing, or glue laminating 4-inch by 8-inch timbers together. If the panels were to be used for more than 1 or 2 years, they would also need to be pressure treated with an approved preservative. The timber should be treated in conformance with American Wood-Preservers' Association C14 (soil contact) and the Western Wood Preservers Institute's publication *Best Management Practices for the Use of Treated Wood in Aquatic Environments* (www.wwpinstitute.org). Insofar as is practical, all lumber should be cut, drilled, and completely fabricated prior to pressure treatment.

Installation

Two people could place and attach the bridge panels to the leveling sills using standard field equipment in approximately 30 minutes.

Cost

Approximately $1,650 in materials was needed to construct the bridge, of which $1,500 was used for wood materials and $150 for hardware.

Performance

The bridges were used on three different timber sales on the Homochitto National Forest and have carried more than a million board feet of timber. The operators were pleased that the drainages were not disturbed, and the contractor was able to save time by traveling over the drainages rather than around them.

For more information, contact:

Merv Eriksson
USDA Forest Service
Pacific Northwest Region
P.O. Box 3623
Portland, OR 97208-3623
Phone: 503-808-2230
FAX: 503-808-2511
Email: meriksson@fs.fed.us

James R. Bassel (Retired)
USDA Forest Service
444 East Bonita
San Dimas, CA 91773
Phone: 909-599-1267 Ext. 259
FAX: 909-592-2309
Email: jbassel@fs.fed.us

APPENDIX A: Federal Requirements for Forest Roads in Wetlands

Section 404 of the Federal Clean Water Act regulates the placement of fill (including roadbeds) into wetlands and waters of the United States. The following 15 BMPs must be implemented in order to qualify for the silvicultural exemption from a Federal section 404 permit when building a temporary or permanent road or skid trail in a wetland (33 CFR part 323.4). The silvicultural exemption is only applicable when the primary purpose of the road is for normal silvicultural purposes. This listing is an attempt to explain the 15 BMPs in lay language. The exact language of the law may be obtained by contacting the U.S. Army Corps of Engineers (www.usace.army.mil).

1. Limit the number, length, and width of roads and skid trails to the minimum necessary to accomplish the landowner's objective.
2. Locate roads outside streamside management zones except at stream crossings.
3. Road fill must be bridged, culverted, or otherwise designed to prevent restriction of expected floodflows.
4. Properly stabilize and maintain road fill material during and after road construction to prevent erosion.
5. While building a road with fill material, minimize the use of road construction equipment in the wetland area that lies outside the boundaries of the road fill.
6. Minimize disturbance of vegetation while designing, constructing, and maintaining roads.
7. Correctly design, construct, and maintain wetland road crossings to avoid disrupting the migration or movement of fish and other aquatic life.
8. Use fill from upland sources whenever feasible.
9. Place fill in a way that does not take or jeopardize the continued existence of a threatened or endangered species (as defined under the Endangered Species Act) or adversely modify or destroy the critical habitat of such species.
10. Avoid placing fill in breeding and nesting areas for migratory waterfowl, in spawning areas, and in wetlands if practical alternatives exist.
11. Do not place fill near a public water supply intake.
12. Do not place fill in areas of concentrated shellfish or mussel production.
13. Do not place fill in water bodies or on land regarded as part of the National Wild and Scenic Rivers System.
14. Use fill free of toxic levels of pollutants.
15. Completely remove all temporary fills and restore the area to its original elevation.

Source: Wisconsin Department of Natural Resources (www.dnr.state.wi.us).

APPENDIX B: State BMPs for Portable Bridge Stream Crossings

IMPORTANT

Every effort has been made to provide correct, complete, and up-to-date information in the following appendix. Nevertheless, changes in permitting and regulations occur constantly. Therefore, it is important that the appropriate local and State agencies be contacted for current information before proceeding with a stream crossing.

Alabama

1) State agency that has legislative authority for enforcing water pollution laws:

Chief, Mining & Nonpoint Source Section
Alabama Department of Environmental Management
Field Operations Division
P.O. Box 301463
Montgomery, AL 36130-1463
Phone: 334-394-4311
FAX: 334-394-4326
E-mail: mnps@adem.state.al.us
Web site: www.adem.state.al.us

2) A formal permit is not required to cross perennial streams.

Clean Water Act (CWA) Section 401 State water quality certification is required for activities that need U.S. Army Corps of Engineers CWA Section 404 individual permit authorization.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

However, failure to conduct the activity and voluntarily implement and maintain effective BMPs to prevent discharges of pollutants at levels that could cause or contribute to a violation of applicable State water quality standards, or could result in a significant contribution of pollutants to State waters, may subject the operator to enforcement action.

6) BMPs that pertain to portable bridge stream crossings:

- Minimize the number of stream crossings.
- Implement and maintain effective erosion and sediment stabilization practices at all times.
- Bridges and overflow culverts should be constructed to minimize changes in natural streambeds during high water.
- Crossings must be designed and maintained to account for waterflow generated by expected precipitation events, so as to ensure the structural integrity and stability of the crossing and prevent its loss or failure.
- Dirt fills for bridge approaches should be protected from erosion.
- The deposit of slash and/or construction debris into State waters must be prevented or minimized to the maximum extent practical. Slash and/or construction debris that is inadvertently deposited in State waters shall be removed as quickly as possible.

- Open-top culverts, water bars, or broad-based dips placed in the road on either side of the stream crossing will minimize water movement down the road and into the stream.
- Culverts, logs, or portable bridges used for temporary crossings should be removed promptly upon completion of use and any disturbed streambanks and approaches to the water body must be stabilized and revegetated immediately.

7) Silvicultural/logging BMP contact in the State Forester's office:

State Forester
Alabama Forestry Commission
P.O. Box 302550
Montgomery, AL 36130-2550
Phone: 334-240-9300
FAX: 334-240-9390
Web site: www.forestry.state.al.us

Sources:

Alabama Forestry Commission. 1999. Best Management Practices for Alabama.

Hulcher, R. 2002. Alabama Department of Environmental Management, Field Operations Division, Mining & Nonpoint Source Section. Personal e-mail. 20 September.

Alaska

1) State agencies that have legislative authority for enforcing water pollution laws:

Section Manager
Alaska Department of Environmental Conservation
Division of Water
410 Willoughby Ave., Suite 303
Juneau, AK 99801-1795
Phone: 907-465-5257
FAX: 907-465-5274
Web site: www.state.ak.us/dec/water/wnpspc/forestry/forestry.htm

Program Manager
Alaska Department of Natural Resources
Division of Forestry
550 West 7th Ave., Suite 1450
Anchorage, AK 99501-3566
Phone: 907-269-8474
FAX: 907-269-8931
Web site: www.dnr.state.ak.us/forestry

2) A formal permit may be required to cross perennial streams.

Under the Alaska Forest Resources and Practices Act and Regulations, a permit is only required if a proposed activity or disturbance will occur within the ordinary high-water marks of an anadromous stream catalogued as important for the spawning, rearing, or migration of anadromous fish. Permits can be obtained through the Department of Fish and Game.

For those anadromous fish streams that have not been catalogued, mandatory BMPs of the Alaska Forest Resources and Practices Regulations apply.

Those stream crossings that do not require a permit must still be identified in the Detailed Plan of Operations (DPO) and reviewed by the Department of Natural Resources-Division of Forestry; Department of Fish and Game-Habitat Division; and the Department of Environmental Conservation-Division of Water.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

1. An operator shall install a bridge on a forest road according to the following standards:

    - A temporary bridge and the adjacent roadway must be constructed to pass or withstand the 25-year flood without damage. Any adjustment to these design standards must be determined in the field considering the characteristics of the drainage and stream crossing, the design life of the bridge, the importance of downstream resources, the type of construction techniques, and the likelihood of bridge failure during a flood. An operator shall, as necessary, minimize potential flood damage to the structure and to downstream water quality and fish habitat by installing relief culverts through approach roads or by other means.
    - An earth embankment constructed for use as a bridge approach must be protected from erosion by using planted or seeded ground cover, bulkheads, rock riprap, retaining walls, or other equally effective means.
    - On rock-decked bridges, curbs must be installed to contain road surface material, and a filter fabric must be laid underneath the material to prevent it from falling within the ordinary high-water marks of the water body.
    - A bridge must be installed to provide fish passage in accordance with AS 16.05.840.
    - In deep V-notches or in drainages where a culvert may require substantial fill, a bridge is the preferred crossing structure.
    - A bridge must be installed in such a way as to minimize disturbance to the bed and banks of a stream.

2. In addition to the above requirements (section 1), when installing a new bridge or replacing an existing bridge on a forest road that crosses anadromous fish waters, the installation must be in accordance with the standards outlined in the section below (section 3). In anadromous fish waters catalogued under AS 16.05.870, an operator may not cross the water body with equipment, install a bridge or conduct excavation for bridges, place sills or abutments, or place stringers or girders within the ordinary high-water marks without prior written approval from the Department of Fish and Game. If prior written approval is required by the Department of Fish and Game under AS 16.05.870, an operator shall comply with that department's requirements instead of the standards listed below in section 3.

3. When installing a bridge over anadromous waters that have not been catalogued under AS 16.05.870, an operator shall:

    - Locate a bridge where the banks are stable;
    - Locate a bridge on a straight reach of stream;
    - Locate a bridge where the bank and approach characteristics are suitable;
    - Schedule bridge building activity to occur during a period that will avoid or reduce adverse impact on fish; and
    - Where feasible, avoid the use of center supports.

4. An operator may not narrow an anadromous stream between its ordinary high-water marks.

7) Silvicultural/logging BMP contact in the State Forester's office:

Coastal Regional Forester
Alaska Dept. of Natural Resources
101 Airport Road
Palmer, AK 99645
Phone: 907-761-2491
FAX: 907-761-6201
Web site: www.dnr.state.ak.us/forestry

Northern Regional Forester
Alaska Dept. of Natural Resources
3700 Airport Way
Fairbanks, AK 99709-4699
Phone: 907-451-2666
FAX: 907-451-2690
Web site: www.dnr.state.ak.us/forestry

Sources:

Alaska Department of Natural Resources, Division of Forestry. 2000. Alaska Forest Resources & Practices Regulations.

Eleazer, J. 2002. Alaska Department of Natural Resources, Division of Forestry. Personal e-mail. 18 September.

Hanley, K. 2002. Alaska Department of Environmental Conservation, Division of Air and Water Quality. Personal e-mail. 20 September.

Arizona

1) State and Federal agencies that have legislative authority for enforcing water pollution laws:

Environmental Program Supervisor
Arizona Department of Environmental Quality
1110 West Washington
Phoenix, AZ 85007-2935
Phone: 602-771-2300
FAX: 602-771-4528
Web site: www.adeq.state.az.us

U.S. Army Corps of Engineers
Arizona Regulatory Section
3636 N. Central Avenue Suite 900
Phoenix, AZ 85012
Phone: 602-640-5385
FAX: 602-640-5382
Web site: www.spl.usace.army.mil

U.S. EPA Region 9
75 Hawthorne Street
San Francisco, CA 94105
Phone: 415-947-8000
Toll Free Phone: 866-EPA-WEST
E-mail: r9.info@epa.gov
Web site: www.epa.gov/region09

The Arizona Department of Environmental Quality (ADEQ) is responsible for protecting water quality within the State of Arizona on nonTribal lands. The U.S. Army Corps of Engineers (ACOE) may regulate portable bridge crossings. The ACOE regulates activities impacting waters of the U.S. (WUS) under Section 404 of the Clean Water Act (CWA). The Environmental Protection Agency (EPA) has 401 authority over Tribal lands in Arizona, except for the Fort Apache Reservation, which regulates itself.

2) A formal permit is required to cross perennial streams.

The ACOE issues 404 Permits for projects that discharge dredged and/or fill material in WUS. There are two types of 404 Permits: Individual 404 Permits and Nationwide Permits (NWP) issued for specific activities. Bridges are considered "Linear Transportation Projects," which fall under NWP 14.

The ADEQ is responsible for CWA Section 401 Water Quality Certification for ACOE 404 Permits. The ADEQ issues Individual 401 Water Quality Certifications for all Individual 404 Permits and for some NWPs. NWP 14 Linear Transportation Projects have been conditionally certified by the ADEQ (on nonTribal land) for all waters except "Unique Waters" of the State, which require Individual 401 Certification.

1. A State Section 401 Water Quality Certification is required for all bridge projects not conditionally certified under a U.S. Army Corps of Engineers NWP 14.

2. The State Water Quality Certification contains conditions (BMPs) that must be followed during project construction activities on nonTribal lands.

3. An application for Individual 401 Water Quality Certification must be submitted to the ADEQ to obtain a 401 Water Quality Certification.

   Information regarding 401 Water Quality Certification can be found on the ADEQ Web site at: www.adeq.state.az.us/environ/water/permits/sect404.html.

If the proposed crossing is over State Trust Lands, which are administered by the Arizona State Land Department, a right-of-way (ROW) or construction easement is required in addition to any permits required from the Arizona Department of Environmental Quality and the U.S. Army Corps of Engineers.

3) A formal permit is required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Culverts, coarse rock fills, hardened fords (using such features as rock approaches), low-water crossings, and temporary bridges shall be evaluated in the Integrated Resource Management process for each sensitive stream crossing. Such facilities shall be designed to provide for unobstructed flows and the passage of fish and to minimize damages to stream courses.
- The number of crossings shall be kept to the minimum needed for access.
- Channel crossings shall be as perpendicular to stream courses as possible.
- Streambank excavation shall be kept to the minimum needed for use of the crossings, and entry and exit ramps may need to be rocked.
- Crossing facilities will be removed when the facility is no longer needed, or if the crossing obstructs high flows, prior to closing down operations for the season.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forestry Section Chief
Arizona State Land Department
Fire Management Division
3650 Lake Mary Road
Flagstaff, AZ 86001
Phone: 928-774-1425
FAX: 928-779-2143
Web site: www.land.state.az.us/divisions/fire.htm

Sources:

Cajero-Travers, A. 2003. Arizona Department of Environmental Quality, Surface Water Permitting Unit. Personal e-mail. 17 January.

Lester, C. 2003. U.S. Army Corps of Engineers. Personal e-mail. 27 January.

USDA Forest Service. 1990. Soil & Water Conservation Practices Handbook: Southwestern Region.

Ward, S. 2002. Arizona Department of Environmental Quality, Water Quality Division, Watershed Management Unit. Personal e-mail. 25 September.

Arkansas

1) State agency that has legislative authority for enforcing water pollution laws:

Assistant Chief of Water Quality Enforcement
Arkansas Department of Environmental Quality (ADEQ)
8001 National Drive
P.O. Box 8913
Little Rock, AR 72219-8913
Phone: 501-682-0744
FAX: 501-682-0910
Web site: www.adeq.state.ar.us

2) A formal permit may be required to cross perennial streams.

Depending on location, the decision is made by the Memphis or Little Rock District Office of the U.S. Army Corps of Engineers.

Little Rock District, U.S. Army Corps of Engineers
Public Affairs Office
P.O. Box 867
Little Rock, AR 72203-0867
Phone: 501-324-5551
Web site: www.swl.usace.army.mil

Memphis District, U.S. Army Corps of Engineers
Public Affairs Office
167 North Main
Memphis, TN 38103
Phone: 901-544-3360
Web site: www.mvm.usace.army.mil

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Cross streams only if the harvest site cannot be reasonably accessed otherwise.
- Except for crossings, equipment should stay out of streambeds.

- Design bridges to protect stream-crossing approaches from erosion. The streambank, stream channel, and adjacent Streamside Management Zone (SMZ) should have minimum disturbance. Construct stream crossings during periods of dry weather when streamflow is low and the chance of erosion is minimal. Concrete slabs should be excavated so that the surface is level with the stream bottom and at the same slope. Concrete slab approaches should extend beyond the stream channel to prevent scour around the ends of the slab.
- Remove excess material and woody debris generated during road construction from streams. Deposit this material above the ordinary high-water mark. Stabilize the material. Use headwalls, wingwalls, riprap, or geomat if necessary.
- Inspect stream crossings frequently during operations to determine if erosion is being controlled. Streambanks should be stable and soil movement into the streams should be minimal. Correct erosion problems by implementing the BMPs discussed in Section 11 of the Arkansas Forestry Best Management Practices for Water Quality Protection manual.
- Bridges should not constrict clearly defined stream channels. Bridges should allow bankfull discharge to pass under the bridge unrestricted when bankfull water levels are anticipated.
- Remove temporary crossing structures after use. Stabilize and restore the streambanks.

7) Silvicultural/logging BMP contact in the State Forester's office:

Best Management Practice Forester
Arkansas Forestry Commission
3821 West Roosevelt Road
Little Rock, AR 72204
Phone: 501-296-1944
FAX: 501-296-1949
Web site: www.forestry.state.ar.us

Sources:

Arkansas Forestry Commission. 2002. Arkansas Forestry Best Management Practices for Water Quality Protection.

Patrick, K. 2002. Arkansas Department of Environmental Quality. Personal e-mail. 29 October.

California

1) State agencies that have legislative authority for enforcing water pollution laws:

Two State agencies are primarily responsible for the protection of water quality from potential impacts associated with timber harvesting—the California Environmental Protection Agency (Cal EPA, which has primary responsibility and authority) and the Resources Agency (which has responsibility and authority through a certified program administered by the California Department of Forestry (CDF)). In addition to the State Board, Cal EPA has several Regional Water Quality Control Boards that act independently from the State Board to enforce "Basin Plans" as the primary mechanism for ensuring the protection of beneficial uses of water. When approving projects under the certified program, the CDF must ensure that a project conforms to the requirements of the applicable Basin Plan. There are 9 "regions" in the State governed by the Regional Water Quality Control Boards. Contact information for each of these regions can be found on the following Web site: www.swrcb.ca.gov/regions.html.

Resources Agency
Deputy Chief for Timber Environmental
California Department of Forestry
and Fire Protection (CDF)
Harvest Administration
Board (WQ)
Sacramento, CA 94244-2460
Phone: 916-653-9422
FAX: 916-653-8957
Web site: www.fire.ca.gov

Cal EPA
Forest Activities Program Manager
State Water Resource Control
1001 I-Street
Sacramento, CA 95814
Phone: 916-341-5478
FAX: 916-341-5470
Web site: www.swrcb.ca.gov

Resources Agency
Environmental Specialist IV
California Department of Fish and Game (DFG)
Native Anadromous Fish and Watershed Branch
1807 13th Street, Suite 104
Sacramento, CA 95814
Phone: 916-327-8839
FAX: 916-327-8854
Web site: www.dfg.ca.gov

2) A formal permit is required to cross perennial streams.

If a stream is crossed for forestry activities and the crossing would alter the channel or the bank, then an application for a Streambed Alteration Permit must be made to the California Department of Fish and Game (DFG). Currently, the required California Environmental Quality Act (CEQA) review for issuance of this permit is done through the California Department of Forestry's (CDF's) certified program. There is a cooperative, multiagency review of these crossings by the

CDF, DFG, WQ, and the California Geologic Survey (CGS). This is done prior to approval by the CDF, issuance of a Timber Harvest Plan (THP), and issuance of the Streambed Alteration Permit by the DFG. If the stream is crossed for any other reason besides forestry activities, then the permit is processed and approved by the DFG.

3) A formal permit is required to cross intermittent streams.

Same permit process and requirements as above.

4) There are Forest Practice Rules for forestry practices.

5) The use of the Forest Practice Rules is mandatory.

6) Forest Practice Rules that pertain to portable bridge stream crossings:

Tractor Road Watercourse Crossing [All Districts]
Watercourse-crossing facilities on tractor roads shall be planned, constructed, maintained, and removed according to the following standards:

- The number of crossings shall be kept to a minimum. Existing crossing locations shall be used wherever feasible.
- A prepared watercourse crossing using a structure such as a bridge, culvert, or temporary log culvert shall be used to protect the watercourse from siltation where tractor roads cross a watercourse in which water may be present during the life of the crossing.
- Crossing facilities on watercourses that support fish shall allow for unrestricted passage of all life stages of fish that may be present and for unrestricted passage of water. Such crossing facilities shall be fully described in sufficient clarity and detail to allow evaluation by the review team and the public, provide direction to the Licensed Timber Operator (LTO) for implementation, and provide enforceable standards for the inspector.
- Watercourse-crossing facilities not constructed to permanent crossing standards on tractor roads shall be removed before the beginning of the winter period. If a watercourse is to be removed, it shall be removed in accordance with 14 CCR 923.3(d) [943.3(d), 963.3(d)].
- Consistent with the protection of water quality, exceptions may be provided through the Fish and Game Code and shall be indicated in the plan.

Watercourse Crossings [All Districts]
Watercourse-crossing drainage structures on logging roads shall be planned, constructed, reconstructed, and maintained or removed according to the following standards. Exceptions may be provided through application of Fish and Game Code Sections 1601 and 1603 and shall be included in the Timber Harvest Plan (THP).

- The location of all new permanent watercourse-crossing drainage structures and temporary crossings located within the Watercourse and Lake Protection Zones (WLPZ) shall be shown on the THP map.
- The number of crossings shall be kept to a minimum.

- Drainage structures on watercourses that support fish shall allow for unrestricted passage of all life stages of fish that may be present and shall be fully described in the plan in sufficient clarity and detail to allow evaluation by the review team and the public, provide direction to the LTO for implementation, and provide enforceable standards for the inspector.
- When watercourse crossings, other drainage structures, and associated fills are removed, the following standards shall apply:

    - Fills shall be excavated to form a channel that is as close as feasible to the natural watercourse grade and orientation and that is wider than the natural channel.
    - The excavated material and any resulting cut bank shall be sloped back from the channel and stabilized to prevent slumping and to minimize soil erosion. Where needed, this material shall be stabilized by seeding, mulching, rock armoring, or other suitable treatment.

7) Silvicultural/logging Forest Practice Rules contact in the State Forester's office:

Deputy Chief for Timber Environmental Harvest Administration
California Department of Forestry and Fire Protection
P.O. Box 944246
Sacramento, CA 94244-2460
Phone: 916-653-9422
FAX: 916-653-8957
Web site: www.fire.ca.gov

Sources:

California Department of Forestry and Fire Protection, Resource Management, Forest Practice Program. 2002. California Forest Practice Rules.

Hall, D. 2002. California Department of Forestry and Fire Protection. Personal e-mail. 20 September.

Colorado

1) State agency that has legislative authority for enforcing water pollution laws:

Non-point Source Program Coordinator
Colorado Department of Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive, South
Denver, CO 80246
Phone: 303-692-3570
FAX: 303-782-0390
Web site: www.cdphe.state.co.us/wq/wqhom.asp

2) A formal permit may be required to cross perennial streams.

In some cases it is necessary to secure certain permits prior to altering a stream channel. Compliance with Section 404 of the Clean Water Act is necessary if the activity has the potential to impact any water area considered "waters of the U.S." Only consultation with the appropriate agency will determine the actual need for a 404 permit. The landowner and/or operator should consult with their local U.S. Army Corps of Engineers regarding 404 permit information.

3) A formal permit may be required to cross intermittent streams.

Depends on the activity as defined under Section 404 of the Clean Water Act.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

Design Considerations

- Design a stream crossing that allows adequate passage of fish, has minimum impact on water quality, and can handle peak runoff and floodwaters.
- Cross streams at right angles to the main channel if practical.
- Adjust the road grade to reduce the concentration of water carried by drainage ditches to stream crossings.
- Direct drainage flows through a Streamside Management Zone (SMZ) and away from the stream-crossing site.

Installation of Stream Crossings

- Minimize stream channel disturbances and related sediment problems during road construction and installation of stream-crossing structures.
- Time construction activities to protect fisheries and water quality.

- Do not place erodible material into stream channels. Remove stockpiled material from high-water zones.
- Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Management Division Supervisor
Colorado State Forest Service
Colorado State University
Fort Collins, CO 80523
Phone: 970-491-6303
FAX: 970-491-7736
Web site: www.colostate.edu/Depts/CSFS

Source:

Colorado Timber Industry Association and Colorado State Forest Service. 1998. Colorado Forest Stewardship Guidelines to Protect Water Quality – Best Management Practices for Colorado.

Connecticut

1) State agency that has legislative authority for enforcing water pollution laws:

State law gives municipalities the authority to enforce water pollution laws.

2) A formal permit is required to cross perennial streams.

Permit requirements differ in each town. To check for necessary permits, the operator should contact the town Inland Wetlands Agency or the Water Resources Bureau, Department of Environmental Protection.

3) A formal permit is required to cross intermittent streams.

See permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Cross streams at a 90-degree angle and approach the stream in as gentle a slope as possible. State and local regulations may require bridging streams, particularly on municipal watersheds.
- Stream crossings on truck roads usually should be made through the use of bridges or culverts.
- Stream crossings should be constructed at a point along the stream where the erosion hazard can be minimized. The stream channel should be straight and have a gentle gradient. If possible, locate the crossing in a flat area where floodwaters can disperse.
- Logging activities, except for the necessary and proper installation of stream-crossing structures, must be kept out of stream channels.

7) Silvicultural/logging BMP contact in the State Forester's office:

Connecticut Department of Environmental Protection
Bureau of Natural Resources
Division of Forestry
79 Elm Street
Hartford, CT 06106
Phone: 860-424-3630
FAX: 860-424-4070
Web site: www.dep.state.ct.us

Source:

Connecticut Resource Conservation & Development Forestry Committee. 1998. A Practical Guide for Protecting Water Quality While Harvesting Forest Products.

Delaware

1) State agency that has legislative authority for enforcing water pollution laws:

Program Manager for Sediment and Stormwater
Department of Natural Resources and Environmental Conservation
Division of Water Resources
89 Kings Highway
Dover, DE 19901
Phone: 302-739-8014
General phone: 302-739-4860
FAX: 302-739-6724
Web site: www.dnrec.state.de.us

2) A formal permit may be required to cross perennial streams.

A permit is required on any logging job that is over 1 acre in size, regardless if a stream is present or not. On the permit, the logger must state if a stream is present, what type (perennial, intermittent, or tax ditch), if it will be crossed, and how it will be crossed.

3) A formal permit may be required to cross intermittent streams.

See above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Bridges should be constructed with minimal disturbance to the streambank, channel, and an adjacent Stream Management Zone (SMZ).
- A bridge should be designed to permit unimpeded waterflow beneath it resulting from a 5-year, 24-hour frequency storm event.
- The surface of the bridge should be designed to adequately direct stormwater away from the bridge.
- Whenever possible, avoid locating bridges on saturated and erodible soils. If construction is required on these soils, design the bridge long enough to discharge traffic to stable roadbeds on both sides of the water.
- Locate bridges at the narrowest stream width whenever possible.
- Bridges should cross the water body at right angles and on as level of topography as possible. Where adjacent land slopes to the desired bridge location, design bridge entrance and exit roadways to minimize runoff by installing water turnouts.

- Design bridge length and width specifications to distribute traffic loads evenly, while preventing erosion on the top streambanks.

7) Silvicultural/logging BMP contact in the State Forester's office:

Senior Forester
Delaware Department of Agriculture
Forest Service
2320 S. Dupont Highway
Dover, DE 19901-5515
Phone: 302-698-4549
FAX: 302-697-6245
Web site: www.state.de.us/deptagri/forestry/index.htm

Source:

Delaware Department of Agriculture, Forest Service. 1995. Delaware's Forestry Best Management Practices Manual.

Florida

1) State agency that has legislative authority for enforcing water pollution laws:

Florida Department of Environmental Protection
Bureau of Watershed Management
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Phone: 850-245-8430
FAX: 850-245-8434
Web site: www.dep.state.fl.us

5 Water Management Districts
Northwest Florida WMD
81 Water Management Drive
Havana, FL 32333
Phone: 850-539-5999

Suwannee River WMD
9225 CR 49
Live Oak, FL 32060
Phone: 904-362-1001

St. Johns River WMD
P.O. Box 1429
Palatka, FL 32178
Phone: 904-329-4500

Southwest Florida WMD
2379 Broad Street
Brooksville, FL 34609
Phone: 352-796-7211

South Florida WMD
3301 Gun Club Road
West Palm Beach, FL 33416
Phone: 561-686-8800

2) A formal permit may be required to cross perennial streams.

An operator qualifies for a Noticed General Permit for forestry activities provided that the stream crossing will comply with all applicable water management district rules and BMPs. In this case, no permit is actually issued, but the water management district does receive and file the Notification of Intent (NOI).

If the BMPs are not adhered to in the construction or use of the stream crossing, then the operator must go through the full permit process to obtain an environmental resource permit from the water management district.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Minimize the number of crossings on a given stream, and cross streams perpendicular to the flow at the narrowest section. This minimizes the area of disturbance and simplifies construction.
- Any erodible fill material or other areas normally exposed to flowing water should be stabilized with riprap, vegetation, or other appropriate material following construction.
- Avoid planning construction of crossings during wet periods and avoid construction during high-water conditions.

7) Incentives for using portable bridges during harvesting activities:

There is a restriction on how close together stream crossings can be. Portable bridge crossings only have to be ¼ mile apart whereas permanent bridges have to be ½ mile apart.

8) Silvicultural/logging BMP contact in the State Forester's office:

Forest Hydrologist
Florida Department of Agriculture and Consumer Services
Division of Forestry
3125 Conner Boulevard
Tallahassee, FL 32399-1650
Phone: 850-414-9935
FAX: 850-488-0863
Web site: www.fl-dof.com

Sources:

Florida Department of Agriculture and Consumer Services, Division of Forestry. 2000. Application of BMPs: Stream Crossings – Silviculture Best Management Practices.

Livingston, E. 2002. Florida Department of Environmental Protection, Bureau of Watershed Management. Personal e-mail. 18 September.

Georgia

1) State agency that has legislative authority for enforcing water pollution laws:

Georgia Department of Natural Resources
Environmental Protection Division
Water Protection Branch
4220 International Parkway
Suite 101
Atlanta, GA 30354
Phone: 404-675-6232
FAX: 404-675-6245
Web site: www.state.ga.us/dnr/environ

2) A formal permit is not required to cross perennial streams, provided the crossing is used for silvicultural purposes and in accordance with Georgia and federally mandated BMPs.

3) A formal permit is not required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is conditional.

The use of BMPs depends on the location within the State. In some sensitive areas, such as within public water supply watershed/reservoirs, protected river corridors, or protected mountain tops, BMPs are mandatory, and in other areas their use is voluntary but subject to the Georgia Water Quality Control Act.

The Georgia Water Quality Control Act states that if there is a significant visual increase in turbidity or temperature and it is because BMPs have not been followed, then this constitutes a violation and is subject to civil fines and penalties up to $50,000 per day.

For registered foresters, the use of BMPs is obligatory because BMPs are part of their Code of Ethics and Standards of Practice.

6) BMPs that pertain to portable bridge stream crossings:

<u>Stream Crossings for Roads</u>
Stream crossings should be avoided, if possible, through pre-harvest planning. Where crossings are necessary, planning should address the type of road and road-use pattern, stream channel characteristics, streamflow levels, and the aquatic organisms in the stream. Minimizing impacts is critical. Permanent and temporary stream crossings should be based on expected applicable stormflow return intervals and watershed acreage above the crossing.

General BMPs for Stream Crossings

- Approaches to all permanent or temporary stream crossings should be made at gentle grades of slope (3 percent or less) wherever possible.
- Approaches should be made at right angles to streamflow where practical.
- Approaches should have water-control structures, such as water turnouts or broad-based dips, on both sides of a crossing to prevent road runoff from entering the stream.
- Stabilize approaches, if necessary, with rock extending at least 50 feet from both sides of the streambank during the operation.
- For temporary access roads, temporary bridges or spans are favored over culverts or fords.
- Build wetlands fill roads outside the Streamside Management Zone (SMZ), except when crossing the channel. Cross-drainage structures (culverts, bridges, portable spans, etc.) may be necessary in the fill road to allow for surface water movement across the site.
- Stabilize exposed soil around permanent or temporary stream and wetland crossings with any one or a combination of the following: seed and mulch, hay bales, rock, silt fence, geotextiles, and/or excelsior blankets.

Specific BMPs for Bridges

- In watersheds of 300 acres or more, use bridges to cross streams if other alternatives are not suitable for containing stormflows.
- Remove temporary bridges and stabilize approaches and streambanks when operations are completed.

7) Incentives for using portable bridges during harvesting activities:

Three sets of portable timber bridges were purchased through the RC&D Loan Program. The bridges are available for loan in the southeastern part of the State, which includes: Laurens, Bleckley, Washington, Wilcox, Pulaski, Dodge, Telfair, Wheeler, Montgomery, Toombs, Treutlen, Emmanuel, and Johnson Counties. A deposit of $1,800 or letter of credit from a bank is required and will be returned when the bridge is returned. The loan period is 3 months.

8) Silvicultural/logging BMP contact in the State Forester's office:

BMP Coordinator
Georgia Forestry Commission
Macon, GA 31202
Phone: 478-751-3498
FAX: 478-751-3465
Web site: www.gfc.state.ga.us

Sources:

Georgia Department of Natural Resources, Environmental Protection Division. 1999. Georgia's Best Management Practices for Forestry.

Green, Frank. 2002. Georgia Forestry Commission. Personal e-mail. 30 October.

Hawaii

1) State agency that has legislative authority for enforcing water pollution laws:

Chief
Hawaii Department of Health
Clean Water Branch
919 Ala Moana Blvd., Room 301
Honolulu, HI 96814
Phone: 808-586-4309
FAX: 808-586-4352
Web site: www.hawaii.gov/health

2) A formal permit may be required to cross perennial streams.

Any activity on lands, both private and government, designated within the conservation district will need approval of the Board of Land and Natural Resources, State of Hawaii. Crossing streams on lands designated as agricultural or urban may require a permit from the Clean Water Branch of the State Department of Health.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is conditional.

BMPs are voluntary for private lands. If the lands are leased State lands or State cost-sharing dollars are involved, then the use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Minimize the number of stream crossings.
- Avoid marshes and wetlands.
- Design bridge and culvert installations, using streamflow data, with a margin of safety proportional to the importance of the road and the protected resources.
- Stream crossing construction should minimally disturb the area in which the crossing is being constructed.
- Avoid diverting water from natural drainageways. Dips, water bars, and cross-drainage culverts should be placed above stream crossings so that water can be filtered through vegetative buffers before entering streams.
- Cross streams at right angles to the stream channel.

- A road may not be located in a Streamside Management Zone (SMZ) except where access is needed to a water crossing, or where there is no feasible alternative. A road in any SMZ must be designated and located to minimize adverse effects on fish habitat and water quality.
- Bridges and overflow culverts should be constructed to minimize changes in natural streambeds during high water.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forestry Program Manager
Hawaii Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street
Room 325
Honolulu, HI 96813
Phone: 808-587-0163
FAX: 808-587-0160
Web site: www.state.hi.us/dlnr/dofaw

Sources:

Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife. 1998. Best Management Practices for Maintaining Water Quality in Hawaii.

Masaki, C. 2002. Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife. Personal e-mail. 30 October.

Idaho

1) State agency that has legislative authority for enforcing water pollution laws:

Stream Channel Protection Program Manager
Idaho Department of Water Resources
1301 North Orchard Street
Boise, ID 83706
Phone: 208-327-7900
FAX: 208-327-7866
Web site: www.idwr.state.id.us

2) A formal permit is required to cross perennial streams.

The Idaho Department of Lands can issue permits for minor alterations related to forest practices. For larger installations (culverts greater than 60 inches in diameter, bridges or fords greater than 75 feet long), a permit is required from the Department of Water Resources.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

Idaho Department of Environmental Quality
Catalog of Stormwater Best Management Practices

Temporary stream crossings should be installed only when it is necessary to cross a stream and a permanent crossing is not feasible or not yet constructed.

Always attempt to minimize or eliminate the need to cross streams. Temporary stream crossings are a direct source of pollution; therefore, every effort should be made to use an alternate method such as a longer detour. When it is absolutely necessary to cross a stream, a well-planned approach will minimize damage to the streambank and reduce erosion.

Use of the following stream-crossing measures below the high-water mark of a stream or other water body (waters of the U.S.) should be carefully evaluated due to Section 404 permit requirements. If the project will remain a Categorically Excluded (Cat-Ex) project, it may proceed if the situation is discussed in the Cat-Ex. Otherwise, Section 404 permitting (401 Certification)/a Water Resources, Stream Alteration Permit, may be required. The design of temporary stream crossings involves extensive knowledge of hydrologic processes, and therefore must be designed by a professional engineer.

Design and Planning Parameters - General

Instream Excavation: Instream excavation shall be limited to only that necessary to allow installation of the temporary bridge or culvert as described below.

Elimination of Fish Migration Barriers: Temporary bridges pose the least potential for creating barriers to aquatic migration. The construction of a temporary bridge or culvert shall not cause a significant water level difference between the upstream and downstream water surface elevations.

Crossing Alignment: The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

Road Approaches: The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50-foot minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

Surface Water Diverting Structure: A water-diverting structure, such as a swale, shall be constructed across the roadway on both roadway approaches 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the BMP factsheet in the Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

Road Width: All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

Time of Operation: All temporary crossings shall be removed within 14 calendar days after the structure is no longer needed. Unless prior written approval is obtained from the Water Resources Administration, all structures shall be removed within 1 year from the date of the installation.

Materials

Aggregate: There shall be no earth or soil materials used for construction within the waterway channel. The minimum acceptable aggregate size for temporary crossings shall be ¾ to 4 inches in diameter, also referenced as AASHTO designation No. 1. Larger aggregates will be allowed.

Filter Cloth: Filter cloth is a fabric consisting of either woven or nonwoven plastic,

polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate, and reduce mixing of the aggregate with the subgrade soil. Filter cloths such as Mirafi, Typar, Adva Filter, Polyfilter X, or approved equivalent shall be used, as required by the specific method.

Construction Guidelines - Temporary Bridge

Restriction: Construction, use, or removal of a temporary access bridge will not normally have any time-of-year restrictions because construction, use, or removal should not affect the stream or its banks.

Bridge Placement: A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

Abutments: Abutments shall be placed parallel to and on stable banks.

Bridge Span: Bridges shall be constructed to span the entire channel. If the channel width exceeds 8 feet (as measured from top-of-bank to top-of-bank), then a footing, pier, or bridge support may be constructed within the waterway. One additional footing, pier, or bridge support will be permitted for each additional 8-foot width of the channel. However, no footing, pier, or bridge support will be permitted within the channel for waterways less than 8 feet wide.

Stringers: Stringers shall either be logs, sawn timber, prestressed concrete beams, metal beams, or other approved material.

Deck Material: Decking materials shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

Run Planks (optional): Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

Curbs or Fenders: Curbs and fenders may be installed along the outer sides of the deck. Curbs or fenders are an option that will provide additional safety.

Bridge Anchors: Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors include large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

Stabilization: All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance.

Maintenance - Temporary Bridge

Inspection: Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and streambanks are maintained and not damaged.

Maintenance: Maintenance shall be performed as needed to ensure that the structure complies with the standard and specifications. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the flood plain and stabilized.

Removal: When the temporary bridge is no longer needed, all structures, including abutments and other bridging materials, shall be removed within 14 calendar days. In all cases, the bridge materials shall be removed within 1 year of installation.

Final Cleanup: Final cleanup shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway flood plain.

Equipment: Removal of the bridge and cleanup of the area shall be accomplished without construction equipment working in the waterway channel.

Final Stabilization: All areas disturbed during removal shall be stabilized within 14 calendar days of that disturbance.

Idaho Administrative Code, Department of Water Resources
IDAPA 37.03.07 – Stream Channel Alteration Rules

Construction Procedures (Rule 56)

- Construction shall be done in accordance with the following procedures unless specific approval of other procedures has been given by the Director of the Idaho Department of Water Resources (Director). When an applicant desires to proceed in a manner different from the following, such procedures should be described on the application.
- No construction equipment shall be operated below the existing water surface without specific approval from the Director except as follows: Fording the stream at one location only will be permitted unless otherwise specified; however, vehicles and equipment will not be permitted to push or pull material along the streambed below the existing water level. Work below the water which is essential for preparation of culvert bedding or approved footing installations shall be permitted to the extent that it does not create unnecessary turbidity or stream channel disturbance. Frequent fording will not be permitted in areas where extensive turbidity will be created.
- Any temporary crossings, bridge supports, cofferdams, or other structures that will be needed during the period of construction shall be designed to handle high flows that could be anticipated during the construction period. All structures shall be completely removed from the stream channel at the conclusion of construction and the area shall be restored to a natural appearance.

- Care shall be taken to cause only the minimum necessary disturbance to the natural appearance of the area. Streambank vegetation shall be protected except where its removal is absolutely necessary for completion of the work adjacent to the stream channel.
- Any vegetation, debris, or other material removed during construction shall be disposed of at some location out of the stream channel where it cannot reenter the channel during high streams.
- All new cut or fill slopes that will not be protected with some form of riprap shall be seeded with grass and planted with native vegetation to prevent erosion.
- All fill material shall be placed and compacted in horizontal lifts except as provided for in Rule Subsection 060.05 for uncompacted dike and levee construction. Areas to be filled shall be cleared of all vegetation, debris, and other materials that would be objectionable in the fill.
- The Director may limit the period of construction as needed to minimize conflicts with fish migration and spawning, recreation use, and other uses.

Culverts and Bridges (Rule 62)

- Culverts and bridges shall be capable of carrying streamflows and shall not significantly alter conditions upstream or downstream by causing flooding, turbidity, or other problems. The appearance of such installations shall not detract from the natural surroundings of the area.
- Culverts and bridges should be located so that a direct line of approach exists at both the entrance and exit. Abrupt bends at the entrance or exit shall not exist unless suitable erosion protection is provided.
- The ideal gradient (bottom slope) is one that is steep enough to prevent silting, but flat enough to prevent scouring due to high-velocity flows.
- The size of the culvert or bridge opening shall be such that it is capable of passing design flows without overtopping the streambank or causing flooding or other damage.

Design flows shall be based upon the following minimum criteria:

Drainage Area	**Design Flow Frequency**
Less than 50 sq. mi.	25 years
50 sq. mi. or more	50 years or greatest flow of record, whichever is more

- For culverts and bridges located on USDA Forest Service or other Federal lands, the sizing should comply with the Forest Practices Act as adopted by the Federal agencies or the Department of Lands.
- For culverts or bridges located in a community qualifying for the national flood insurance program, the minimum size culvert shall accommodate the 100-year design flow frequency.
- If the culvert or bridge design is impractical for the site, the crossing may be designed with additional flow capacity outside the actual crossing structure, provided there is no increase in the Base Flood Elevation.

(Note: When flow data on a particular stream are unavailable, it is almost always safe to maintain the existing gradient and cross-section area present in the existing stream channel. Comparing the proposed crossing size with others upstream or downstream is also a valuable means of obtaining information regarding the size needed for a proposed crossing.)

- Minimum clearance shall be at least 1 foot at all bridges. This may need to be increased substantially in areas where ice passage or debris may be a problem.
- When crossings are constructed in erodible material, upstream and downstream ends shall be protected from erosive damage through the use of such methods as dumped rock riprap, headwall structures, etc., and such protection shall extend below the erodible streambed and into the banks at least 2 feet unless some other provisions are made to prevent undermining.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Practices Act Program Manager
Idaho Department of Lands
3780 Industrial Avenue South
Coeur d'Alene, ID 83815
Phone: 208-769-1525
FAX: 208-769-1524
Web site: www2.state.id.us/lands/index.htm

Sources:

Colla, J. 2002. Idaho Department of Lands. Personal e-mail. 26 August.

Idaho Department of Environmental Quality Web site (www2.state.id.us/deq/water/stormwater_catalog/doc_bmp23.asp). Catalog of Stormwater Best Management Practices for Idaho Cities and Counties. Accessed 19 September 2002.

Idaho Department of Water Resources. IDAPA 37.03.07. Stream Channel Alteration Rules.

Illinois

1) State agency that has legislative authority for enforcing water pollution laws:

Bureau Chief
Illinois Environmental Protection Agency
Bureau of Water
1021 N. Grand Avenue E.
P.O. Box 19276-62794
Springfield, IL 62794
Phone: 217-782-1654
FAX: 217-782-5549
Web site: www.epa.state.il.us/water

2) A formal permit may be required to cross perennial streams.

Before installing or constructing a bridge across any intermittent or perennial stream, contact the Illinois Department of Natural Resources (IDNR), Office of Water Resources. A permit is required for construction in a floodway of any stream if the drainage area exceeds 1 square mile in an urban area or 10 square miles in a rural area. The IDNR-Office of Water Resources, U.S. Army Corps of Engineers, and EPA have a joint application form for this permit in Illinois.

Illinois Department of Natural Resources (IDNR), Office of Water Resources
Email: dwrm@dnrmail.state.il.us

Springfield Office
One Natural Resources Way
2nd Floor
Springfield, IL 62702
Phone: 217-782-4437
FAX: 217-785-5014

Chicago Office
310 S Michigan, Rm. 1606
Chicago, IL 60604
Phone: 312-793-3123
FAX: 312-793-5968

Bartlett Office
2050 West Stearns Road
Bartlett, IL 60103
Phone: 847-608-3100
FAX: 847-608-3109

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Stream shall be bridged when appropriate.

- Stream shall be crossed at right angles.
- Stream crossings must be designed, constructed, and maintained to safely handle expected vehicle loads and to minimize disturbance of streambanks, channels, and ultimately, aquatic organisms. Consider streambed material, stream size, storm frequency, flow rates, intensity of use (permanent or temporary), and the passage of fish when planning crossings.
- Use soil-stabilization practices at stream crossings. Use seed and mulch and install temporary sediment-control structures, such as straw bales or silt fences, immediately following construction to minimize erosion into streams. Maintain these practices until the soil is permanently stabilized.
- Design, construct, and maintain stream crossings to avoid disrupting the migration or movement of fish and other aquatic life. Bridges or arch culverts that retain the natural stream bottom and slope are preferred for this reason.
- Install stream crossings using materials that are clean, nonerodible, and not toxic to aquatic life.
- Install stream-crossing structures at right angles to the stream channel.
- Minimize channel changes and the amount of excavation or fill needed at the crossing.
- Limit construction activity in the water to periods of low or normal flow. Keep use of equipment in the stream to a minimum.
- Construct a bridge higher than the road approach to prevent surface runoff from draining onto the crossing structure and into the stream.
- Divert road drainage into undisturbed vegetation outside the Streamside Management Zone (SMZ) so that the drainage does not directly enter the stream.
- Stabilize approaches to the bridge with gravel or other suitable material to reduce sediment entering the stream.
- Anchor temporary structures on one end with a cable or other device so they do not float away during high water. Install them so that they can be easily removed when no longer used, regardless of the season.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Ecology Section Leader
Illinois Department of Natural Resources
#1 Natural Resources Way
Springfield, IL 62702
Phone: 217-785-8772
FAX: 217-785-2438
Web site: www.dnr.state.il.us

Source:

Illinois Department of Natural Resources, Division of Forest Resources. 2000. Forestry Best Management Practices for Illinois.

Indiana

1) State agency that has legislative authority for enforcing water pollution laws:

Indiana Department of Natural Resources
Division of Law Enforcement
Web site: www.in.gov/dnr/lawenfor/index.html

Enforcement is handled through 14 districts.

District 1 Headquarters
9822 N. Turkey Creek Rd.
Syracuse, IN 46567
(219) 457-8092

District 2 Headquarters
1903 St. Mary's Ave.
Fort Wayne, IN 46808
(219) 426-0807

District 3 Headquarters
5921 State Road 43 N.
West Lafayette, IN 47906-9609
(765) 567-2080

District 4 Headquarters
3734 Mounds Rd.
Anderson, IN 46017
(765) 649-1062

District 5 Headquarters
1317 W. Lieber Rd., Suite 2
Cloverdale, IN 46120
(765) 795-3534

District 6 Headquarters
P.O. Box 266
Nashville, IN 47448-0266
(812) 988-9761

District 7 Headquarters
5994 E. State Road 364
Winslow, IN 47598
(812) 789-9538

District 8 Headquarters
3084 N. Dillard Rd.
Birdseye, IN 47513
(812) 685-2498

District 9 Headquarters
11050 Keeler Rd.
Brookville, IN 47012
(765) 647-5835

District 10 Headquarters
100 W. Water Street
Michigan City, IN 46360
(219) 879-5710

North Region Headquarters
R.R. 6 Box 344
Peru, IN 46970
(765) 473-9722

South Region Headquarters
4850 S. St. Rd. 446
Bloomington, IN 47401
(812) 837-9536

Outdoor Education North
P.O. Box 236
Otterbein, IN 47970
(765) 583-2817

Outdoor Education South
P.O. Box 917
Jasper, IN 47547
(812) 482-3093

2) A formal permit may be required to cross perennial streams.

A permit is required to cross any stream with a watershed greater than 1 square mile. Obtain appropriate permits from the Department of Natural Resources, Division of Water. Permits may also be required on watercourses regulated by the Federal Emergency Management Agency (FEMA). These are generally issued through local city or county planning offices.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Avoid crossing streams when possible.
- Plan operations to minimize the number of stream crossings.
- Cross at right angles at a point where the streambed is straight and uniform.
- Minimize the use of equipment in the streambed.
- Limit construction activity to periods of low or normal flow.
- Avoid prolonged activity in salmon streams during spawning periods (March 15 – June 15 and July 15 – Nov. 30).
- Minimize excavation and fill at stream crossings and other disturbances to streambanks and channels.
- Use materials that are clean, nonerodible, and nontoxic.
- Avoid using soil as fill.
- Avoid altering streamflow.
- Divert runoff from roads and trails leading to stream crossings into undisturbed vegetation. Avoid directing runoff directly into streams, including ephemeral streams.
- Construct a bridge crossing at elevations higher than its road approach.
- If necessary, stabilize road and trail approaches to stream crossings with aggregate or other suitable material.
- Stabilize exposed soil as soon as practicable.
- Maintain crossings in safe, functional condition.
- Close temporary crossings by removing portable bridges and obstructions as soon as crossings are no longer needed.
- Utilize a bridge design that will provide safe access and minimize disturbance to the streambank, channel, and the riparian management zone.
- Use temporary or portable bridges instead of culverts to access areas where permanent structures are not needed.
- Place them so as not to unduly constrict stream channels or impede floodwaters.

- Anchor temporary bridge sections on one end with a cable or other device so they do not move downstream during high water.
- Install temporary bridges so they can be removed easily and promptly when they are no longer necessary.

7) Incentives for using portable bridges:

The Indiana Hardwood Lumber Association, working in conjunction with the Indiana Division of Forestry, has a portable timber bridge that is available for a reasonable rental fee. In addition, the Division of Forestry has a portable timber bridge that it will loan, install, and remove free of charge for all State forest timber sales.

8) Silvicultural/logging BMP contact in the State Forester's office:

Watershed Conservation Forester
Indiana Department of Natural Resources
Division of Forestry
6220 Forest Road
Martinsville, IN 46151
Phone: 765-342-4122
FAX: 765-342-4505
Web site: www.in.gov/dnr/forestry/index.html

Source:

Indiana Department of Natural Resources, Division of Forestry Web site (www.in.gov/dnr/forestry/bmp/log9.htm). Forestry BMPs: Stream Crossings. Accessed 29 July 2002.

Iowa

1) State agency that has legislative authority for enforcing water pollution laws:

Division Administrator
Iowa Department of Natural Resources
Environmental Protection Division
Wallace Building
502 East 9th Street
Des Moines, IA 50319-0034
Phone: 515-281-5817
FAX: 515-281-8895
Web site: www.state.ia.us/epd

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

Stream crossings must be designed, constructed, and maintained to safely handle expected vehicle loads and to minimize disturbance of streambanks, channels, and ultimately, aquatic organisms. Consider streambed material, stream size, storm frequency, flow rates, intensity of use (permanent or temporary), and the passage of fish when planning crossings. The USDA Natural Resources Conservation Service (NRCS) or a private consultant can help with designing fords and culverts. To design a bridge, contact a private consultant or experienced contractor.

<u>BMPs for Stream Crossings</u>

- Use soil-stabilization practices on exposed soil at stream crossings. Use seed and mulch and install temporary sediment-control structures, such as straw bales or silt fences, immediately following construction to minimize erosion into streams. Maintain these practices until the soil is permanently stabilized.
- Design, construct, and maintain stream crossings to avoid disrupting the migration or movement of fish and other aquatic life. Bridges or arch culverts that retain the natural stream bottom and slope are preferred for this reason.
- Install stream-crossing structures at right angles to the stream channel.
- Minimize channel changes and the amount of excavation or fill needed at the crossing.
- Limit construction activity in the water to periods of low or normal flow. Keep use of the equipment in the stream to a minimum.

- Construct a bridge or place the fill over a culvert higher than the road approach to prevent surface road runoff from draining into the crossing structure and into the stream.
- Stabilize approaches to bridge, culvert, and ford crossings with aggregate or other suitable material to reduce sediment entering the stream.
- Anchor temporary structures on one end with a cable or other device so they do not float away during high water. Install them so they can be easily removed when no longer used, regardless of the season.
- Avoid areas with riffles and pool complexes, wetlands, mudflats, or vegetated shallows, which are considered special aquatic sites under Clean Water Act (CWA) Section 404 and have strict requirements for permits.
- Divert road drainage into undisturbed vegetation, preferably outside the Streamside Management Area (SMA) so that the drainage does not directly enter the stream.

7) Silvicultural/logging BMP contact in the State Forester's office:

Rural Development Forester
Iowa Department of Natural Resources
Division of Conservation and Recreation
Bureau of Forestry
Wallace State Office Building
East Ninth and Grand Avenue
Des Moines, IA 50319-0034
Phone: 515-281-4924
FAX: 515-281-6794
Web site: www.iowadnr.com/forestry

Source:

Iowa Department of Natural Resources Web site (www.iowadnr.com/forestry/bmps.html). 1998. Forestry Bureau Best Management Practices. Accessed 28 November 2002.

Kansas

1) State agencies that have legislative authority for enforcing water pollution laws:

Director
Kansas Department of Health and Environment
Division of Environment
Bureau of Water
Charles Curtis State Office Building
1000 SW Jackson
Topeka, KS 66612
Phone: 785-296-1500
FAX: 785-368-6368
Web site: www.kdhe.state.ks.us/water/index.html

Agency with authority for enforcing the Obstructions in Streams statute:

Chief Engineer
Kansas Department of Agriculture
Division of Water Resources
The Mills Building
109 SW 9th Street, 2nd Floor
Topeka, KS 66612-1311
Phone: 785-296-3710
FAX: 785-296-1176
Web site: www.accesskansas.org/kda/dwr/index.html

2) A formal permit may be required to cross perennial streams.

A formal permit from the Chief Engineer of the Division of Water Resources is needed for most changes made to a stream channel. There is a small stream exemption, based on the drainage area. If the drainage area is smaller than a predetermined acreage, then a permit is not needed. Drainage area acreage limits vary across the State.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Minimize the number of stream crossings and the ground disturbance.
- Where a stream crossing is necessary, consider installing a temporary crossing with an adequate culvert (one that will handle a 25-year flood event).
- Cross streams at a 90-degree angle and at areas where the streambed and banks are composed of cohesive soils or armored with rock.
- Use bridges to cross streams that are too big for culverts or low-water crossings.

7) Silvicultural/logging BMP contact in the State Forester's office:

Rural Forestry Coordinator
Kansas Forest Service
2610 Claflin Road
Manhattan, KS 66502
Phone: 785-532-3310
FAX: 785-532-3305
Web site: www.kansasforests.org

Sources:

Kansas Forest Service and Kansas State and Extension Forestry. 1995. Wetland & Riparian Best Management Practices for Kansas: No. 11 – Timber Harvesting in Riparian Areas.

Scherer, M. 2002. Kansas Department of Agriculture, Division of Water Resources. Personal e-mail. 28 September.

Kentucky

1) State agency that has legislative authority for enforcing water pollution laws:

Timber Harvesting Compliance Section Supervisor
Kentucky Division of Forestry
627 Comanche Trail
Frankfort, KY 40601
Phone: 502-564-4496
FAX: 502-564-6553
Web site: www.forestry.ky.gov

2) A formal permit may be required to cross perennial streams.

A formal permit is required if the stream drains more than 640 acres.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

Crossing Streams and Sloughs
Minimum Requirements:

- Avoid crossing streams and sloughs, if possible.
- When unavoidable, cross at right angles. Use culverts and bridges without altering natural drainage and without disturbing streambanks and other sensitive areas.
- Retire temporary roads, trails, and landings.

Streams and Other Waters BMPs
Details of these BMPs can be obtained from the *Kentucky Agriculture Water Quality Authority Producer Workbook.* The minimum requirements for each of the four Streams and Other Waters BMPs are as follows:

BMP 1. *Stream Crossing Protection*

- Construct low-water crossings in a manner that does not obstruct the normal flow of the stream.
- Minimize soil erosion and removal of streamside vegetation.

BMP 2. *Sand and Gravel Removal*

- Minimize disturbance to streams by excavation equipment and access gravel from shore as much as possible.

BMP 3. *Streambank and Shoreline Protection*

This includes requirements for streambank stabilization for banks that are eroding at an accelerated rate and stream crossings that might be damaged by vehicular traffic.

BMP 4. *Proper Stream Drainage Maintenance*

Specific requirements for clearing logjams or sediment blockage are as follows:

For projects in streams where the watershed above the work is less than 1 square mile (640 acres):

- Focus work only in areas where problems occur and avoid unnecessary disturbance to adjacent stream habitat.
- Minimize the removal of streamside vegetation. Remove only the necessary vegetation and operate equipment from only one side of the stream.
- Minimize straightening of stream meanders.
- When working in streams that have been channelized, consult the Natural Resources Conservation Service (NRCS) and the Kentucky Division of Water.
- Care should be taken to avoid impacts to wetlands adjacent to streams (see special note on U.S. Army Corps of Engineers notification in the Producer Workbook).

For projects in streams where the watershed above the work is more than 1 square mile (640 acres), assistance must be obtained from sources such as the U.S. Army Corps of Engineers, USDA Natural Resources Conservation Service, private consultants, etc., and the Kentucky Division of Water. The Kentucky Division of Forestry and County Extension offices can help identify the appropriate sources in your area.

7) Silvicultural/logging BMP contacts in the State Forester's office:

Compliance Program Specialist
Kentucky Division of Forestry
Timber Harvesting
627 Comanche Trail
Frankfort, KY 40601
Phone: 502-564-4496
FAX: 502-564-6553

Forest Utilization Section Chief
Kentucky Division of Forestry
Timber Harvesting Compliance

627 Comanche Trail
Frankfort, KY 40601
Phone: 502-564-4496
FAX: 502-564-6553

Sources:

Gracey, E. 2002. Kentucky Division of Forestry. Personal e-mail. 31 October.

University of Kentucky Department of Forestry and Kentucky Division of Forestry. 1998. Field Guide to Best Management Practices for Timber Harvesting in Kentucky.

Louisiana

1) State agency that has legislative authority for enforcing water pollution laws:

Environmental Scientist Supervisor
Louisiana Department of Environmental Quality
7290 Bluebonnet Boulevard
Baton Rouge, LA 70810
Phone: 225-765-2682
FAX: 225-765-0617
Web site: www.deq.state.la.us

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- When necessary, stabilize road surfaces and cut and fill slopes using effective erosion-control and water-control methods (seeding, commercial erosion-control material, riprap, etc.).
- Stream crossings will require frequent inspections during operations to determine their functional and safe condition. When needed, corrective measures should be taken immediately to restore to full function.
- Remove culverts and bridges from temporary stream crossings upon completion of operations and return the crossing as closely as possible to its original condition.
- Bridges should be constructed with minimum disturbance to the streambank, channel, and adjacent Streamside Management Zone (SMZ).
- When it is necessary to protect approaches and roadbed fills near bridges, adequate erosion protection should be provided by headwalls, wingwalls, riprap, etc.
- The use of temporary bridges may be necessary to minimize streambank disturbances and provide a means of temporary access to critical areas when permanent structures are not warranted or needed.

7) Silvicultural/logging BMP contact in the State Forester's office:

Management Chief
Louisiana Office of Forestry
P.O. Box 1628
Baton Rouge, LA 70821
Phone: 225-925-4500

FAX: 225-922-1356
Web site: www.ldaf.state.la.us/divisions/forestry/default.asp

Source:

Louisiana Department of Environmental Quality, Louisiana Department of Agriculture and Forestry, Louisiana Forestry Association. 2001. Recommended Forestry Best Management Practices for Louisiana.

Maine

1) State agencies that have legislative authority for enforcing water pollution laws:

Environmental Specialist IV
Department of Environmental Protection
17 State House Station
Augusta, ME 04333
Phone: 207-287-4728
FAX: 207-287-7191
Web site: www.state.me.us/dep

Regional Supervisor
Land Use Regulation Commission
Permitting and Compliance Division
22 State House Station
Augusta, ME 04333
Phone: 207-287-2631
FAX: 207-287-7439
Web site: www.state.me.us/doc/lurc/lurchome.htm

2) A formal permit may be required to cross perennial streams.

Temporary crossings for timber harvesting are not required to have a permit as long as no filling or dredging of the stream or its banks occurs. Permanent crossings may require a permit. Municipal laws or zoning regulations may also apply.

In organized townships, a DEP permit is required for permanent crossings and crossings involving filling or dredging of the stream or its banks. In most cases, a simple Permit by Rule will suffice. Municipalities also regulate crossings on larger streams under Municipal Shoreland Zoning. In unorganized towns, stream crossings that meet certain standards can usually proceed without a permit by notifying the LURC of intent.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

(The State forestry BMP manual is currently under revision. The following shows existing BMPs.)

The following are proper procedures for bridge construction:

1. Select bridge locations where the water channels are straight and unobstructed and the roads can cross at right angles with reasonably level approaches. Streambanks should be firm and level.
2. Determine whether or not the proposed bridge requires any local or State permit approval.
3. Determine the adequate width of the bridge opening as follows:
   Step 1 – Measure the stream width from high-water mark to high-water mark.
   Step 2 – Divide the stream width into evenly sized blocks.
   Step 3 – Determine the cross-sectional area of each block.
   Step 4 – Add the cross-sectional areas of all the blocks.
   Step 5 – For roads that will be used and maintained after harvest, multiply the total by 2½. For roads that will be discontinued or unmaintained, multiply the total by 3½.

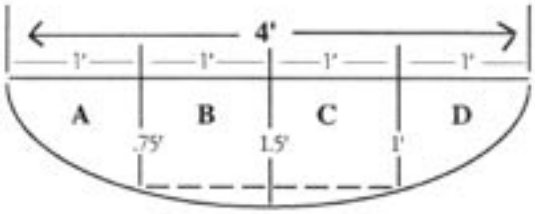
Cross Section =

$A = \frac{1' x .75'}{2} = .375$ *square feet*

$B = \frac{.75' + 1.50'}{2} = \frac{2.25'}{2} = 1.125' x 1' = 1.125$ *square feet*

$C = \frac{1.50' + 1'}{2} = \frac{2.50'}{2} = 1.25' x 1' = 1.25$ *square feet*

$D = \frac{1' x 1'}{2} = .50$ *square feet*



When you total (A) .375
(B) 1.125
(C) 1.25
(D) .50

your result of **3.25 square feet** *reflects the total cross section of the waterway.*

3.25 x 2.5 (10-year) = ***8.125*** *square foot minimum size opening (of bridge/culvert/etc.)*

3.25 x 3.5 (25-year) = ***11.375*** *square foot minimum*

By adding all cross-sectional areas, the total cross-sectional area of this stream is 3.25 square feet. Therefore, if the road will be used and maintained after the harvest, the bridge opening cross section must be 3.25 x 2.5 = 8.125 square feet, or 2½ times the stream's cross-sectional area. For roads that will be discontinued or unmaintained after the harvest, bridges should be removed and the streambanks cleaned up, seeded, or otherwise stabilized. If the bridge is to remain, the bridge opening must be sized to accommodate a 25-year frequency stormflow or the bridge opening cross section must be at least 3½ times the cross-sectional area of the stream.

4. In consultation with a qualified engineer or forester, design the bridge to handle the estimated traffic volume, type, and weight of loads that will use the bridge.
5. Excavate banks just enough to establish a firm base for the foot of the bridge. Do not excavate below the normal high-water mark unless recommended by an engineer or other professional experienced in such excavation.
6. Use logs or metal beams that are sized correctly for the anticipated traffic. For log bridges, it is best to peel, square, or 2-side the timbers.
7. Anchor bridges to prevent washout in periods of high water (use hay bales, etc., to protect exposed soil).
8. Do not gravel the deck. Gravel holds water that can cause the deck to rot.
9. Seed and mulch any disturbed areas outside the roadbed to minimize erosion.
10. Maintain bridges with periodic inspection and removal of any debris that may clog or hinder streamflow.
11. Use of portable bridges is encouraged for small stream crossings because they are handy and can be easily moved with logging vehicles for reuse.
12. When construction of a bridge requires work in the stream, it should be done when the water level is low and in as short a period of time as possible.

7) Incentives for using portable bridges:

The Maine Forest Service currently provides costsharing for loggers to obtain skidder bridges if harvesting will take place in any of eight watersheds where Atlantic salmon has been declared a federally endangered species. Funding is limited, but may be extended in duration and geographic range as available.

8) Silvicultural/logging BMP contact in the State Forester's office:

Water Resources Forester
Maine Forest Service
22 State House Station
Augusta, ME 04333
Phone: 207-287-8430
FAX: 207-287-8422
Web site: www.state.me.us/doc/mfs/mfshome.htm

Sources:

Maine Department of Conservation, Forest Service. 2002. Best Management Practices Field Handbook.

Moesswilde, M. 2002. Maine Forest Service. Personal e-mail. 23 September.

Mullen, M. 2002. Maine Department of Environmental Protection. Personal e-mail. 24 September.

Maryland

1) State agency that has legislative authority for enforcing water pollution laws:

Director of Water Management
Maryland Department of the Environment
Water Management Administration
2500 Broening Highway
Baltimore, MD 21224
Phone: 410-631-3563
General Phone: 800-633-6101
Web site: www.mde.state.md.us

2) A formal permit may be required to cross perennial streams.

Streams draining more than 400 acres, or 100 acres if the stream is a designated trout stream (contact the Water Resources Administration (WRA) for trout waters), may not be crossed except in accordance with a stream-crossing permit. Streams draining less than 400 acres will not require a permit, but crossings should be constructed in accordance with the guidelines in the manual *Soil Erosion and Sediment Control Guidelines for Forest Harvest Operations in Maryland.* A sketch identifying any crossing locations shall be included in the plan.

Permits for a "Temporary Access Crossing" for streams may be required. Check with the Maryland Department of the Environment Water Management Administration before proceeding.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Bridge placement shall be at right angles to the stream or channel flow.
- Abutments will be placed on stable banks and be parallel to the direction of flow.
- Approaches shall be in alignment with the bridge centerline with as little curvature as possible.
- The minimum acceptable bridge width is 10 feet.
- Abutments shall be firmly anchored in stable bank material and be parallel to the thread of the stream or channel. Acceptable materials can be rock, logs, sawn timbers, or a combination of any of the above. Abutment aprons or approaches shall be as close to the gradient of the bridge surface as possible. Abrupt rises or drops from the bridge gradient to the apron

gradient shall be avoided. Elevation shall be above normal high water.

- Stringer material may be logs, sawn timbers, or steel. The centerline gradient of the span shall match that of the road or trail. Log stringers should have a flat upper-bearing face to accept the plank deck as well as a flat bearing surface on abutments. The placement of log stringers on abutments should alternate small and large ends.
- Deck placement shall be perpendicular to stringer direction and tight.
- A curb or fender shall be installed along the outer sides of the deck and be fastened securely to the deck. The minimum size will be 6 inches by 6 inches and will run the entire length of the span. Pole timbers can also be used, but must be straight and of sound quality.
- The structure must be anchored so it will not wash out during high water.
- Military portable temporary bridges or old trailer beds may suffice in certain situations.
- Drainage from approach roads shall be diverted to undisturbed forest floor and is not permitted to drain directly into a watercourse.
- A bridge will have to be removed within 1 year unless the terms of a permit are for permanent construction.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Ecosystem Planning & Analysis
Department of Natural Resources
Forest Service
580 Taylor Avenue
Annapolis, MD 21401
Phone: 410-260-8505
FAX: 410-260-8595
Web site: www.dnr.state.md.us

Source:

Maryland Department of the Environment and the Maryland Forest Service. 1985. Soil Erosion and Sediment Control Guidelines for Forest Harvest Operations in Maryland.

Massachusetts

1) State agencies that have legislative authority for enforcing water pollution laws:

Director
Massachusetts Department of Environmental Management
Division of Forest and Parks
Bureau of Forestry
251 Causeway Street
Suite 600
Boston, MA 02108
Phone: 617-626-1250
FAX: 617-626-1449
Web site: www.mass.gov/dem

Director
Department of Environmental Protection
Bureau of Resource Protection
Wetlands and Waterways Program
One Winter Street
Boston, MA 02108-4746
Phone: 617-292-5500
FAX: 617-292-5696
Web site: www.mass.gov/dep

2) A formal permit may be required to cross perennial streams.

The Forest Cutting Practices Act, Ch. 132, Sections 40-46, requires that a forest cutting plan be filed with the Massachusetts Department of Environmental Management for any commercial timber harvest over 25 MBF or 50 cords. Exemptions from this requirement include certain cutting for agriculture purposes, cutting of rights-of-way for public utilities and public highways, cutting forest products for one's own use, cutting for the purpose of changing land use, and small commercial harvest under the threshold. Stream crossings associated with the forest cutting plan are regulated. Timber harvesting that involves stream crossings that are not covered by the Forest Cutting Practices Act may be subject to local jurisdiction under the State's Wetlands Protection Act and require permitting by the local conservation commission. Regulatory oversight falls under the State's Department of Environmental Protection.

3) A formal permit may be required to cross intermittent streams.

No distinction is made between perennial and intermittent streams in the regulations for both the Forest Cutting Practices Act and the Wetlands Protection Act. Bodies of running water that do not flow throughout the year (intermittent) are considered streams except for the portion upgradient from bogs, swamps, wet meadows, and marshes, which are not considered to be streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

BMPs Required by the Forest Cutting Practices Act (Chapter 132)

- When a crossing is essential, existing old crossings will be rehabilitated and used, provided that it can be shown that this will cause fewer disturbances than constructing a new crossing.
- Temporary crossing structures will be removed at the end of the operation, and the site will be stabilized.
- The rehabilitation, new construction, and stabilization of stream crossings will be done to the standards defined below:

Acceptable crossing methods for differing bank and streambed conditions.

Banks	Streambed	Acceptable Crossing Method
Shallow (*less than 1 foot in height)*	Rocky	Ford with stabilized approaches, corduroy, culvert, bridge
	Soft	Corduroy, bridge, corduroy with culvert
Steep (*greater than 1 foot in height)*	Rocky	Corduroy, culvert, bridge
	Soft	Corduroy, culvert, bridge

- All crossings will be made at right angles to the channel.
- All banks and approaches to stream crossings will be stabilized during and at the end of the operation.
- All stream crossings will be accurately mapped and labeled on the Forest Cutting Plan map and marked on the ground with paint or flagging at the time the plan is filed.
- If a stream crossing must be changed during the operation, the Service Forester must be notified and approve the change before it is made.
- All stream crossings within 1,000 feet upstream of a public water supply reservoir, measured along the course of the stream from the high-water mark of the reservoir, must use a temporary bridge. Exceptions to this will require the filing of an Environmental Notification Form (ENF) in accordance with MGL Chapter 30, sections 61-62H and CMR 11.00. In an Area of Critical Environmental Concern (ACEC), an ENF is required when a nonbridged stream crossing is proposed 2,640 feet (½ mile) or less upstream of a public surface water supply.

Recommended Activities or Guidelines

- Avoid steep or undercut banks. Gentle banks minimize erosion. The approach to the crossing should be level for roughly 50 feet on both sides.
- Use hay bales staked at stream-crossing approaches parallel to banks to catch sediment before it enters the stream. Locate hay bales prior to bridge installation to intercept as much sediment as possible. It is better to use hay bales or silt fence to intercept runoff before it gets into the stream than to use them in the stream itself. Do not use silt fence in a stream. However, if hay bales are used in the stream, they should be staked at least 15 feet downstream to prevent ponding at the crossing. Hay bales that become full of sediment should be removed, placed away from the stream, and replaced with fresh ones.
- It is very important to stabilize the approaches to a stream crossing both during the logging operation and after completion. Unstable approaches are one of the primary ways sediment can enter a stream. Although water bars are generally installed at the end of the timber harvest, it is advisable to install at least one directly uphill from a crossing to prevent water moving down a skid road from reaching a stream. This water bar will need to be occasionally reinforced during the course of the job. The approaches can be corduroyed with poles to prevent rutting and the churning of soil. Consider staking a few hay bales in the skid road at the approach to a stream crossing at the end of the day or week, especially if there are showers or heavy rains in the forecast.
- Before leaving a job, seed and mulch the approaches to stream crossings, banks, and steep sections of skid trails.

7) Silvicultural/logging BMP contact in the State Forester's office:

Program Supervisor-Service Forestry
Department of Environmental Management
Bureau of Forestry
131 Barnum Road, Bldg. 3701
Devens, MA 01432
Phone: 508-792-7716, ext. 142
FAX: 508-792-7718

Sources:

Massachusetts Department of Environmental Protection and U.S. Environmental Protection Agency. 1996. Massachusetts Forestry Best Management Practices Manual.

Soper, J. 2002. Massachusetts Bureau of Forestry. Personal e-mail. 13 September.

Michigan

1) State agency that has legislative authority for enforcing water pollution laws:

Michigan Department of Environmental Quality
Constitution Hall
525 West Allegan Street
P.O. Box 30473
Lansing, MI 48909-7973
Phone: 517-373-7917
Toll Free Phone: 800-662-9278
E-mail: deq-ead-env-assist@michigan.gov
Web site: www.michigan.gov/deq

2) A formal permit is required to cross perennial streams.

Obtain a permit from the Department of Environmental Quality.

3) A formal permit is required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

However, deposition of soil into a stream due to forestry activities is a violation of water quality laws.

6) BMPs that pertain to portable bridge stream crossings:

- Keep the number of crossings to a minimum.
- When it is necessary to cross a stream, cross at a 90-degree angle and approach the stream at as gentle a slope as possible.
- Cross the stream at the shortest point.
- Structures will be sized so as not to impede streamflow in keeping with good drainage practices.
- Road gradients approaching water crossings should be reduced to disperse surface water at least 50 feet from the watercourse, so it will not reach the watercourse.
- Use portable bridges that can be removed after the activity is finished. Logs cannot be skidded through identifiable stream channels. Any skidding of logs or use of machinery through a dry or flowing stream channel is a violation of Michigan's water quality laws.
- Any skid trail necessitating the crossing of a stream (dry or flowing) will require a bridge or a culvert of acceptable design.

- Consider using culverts or bridges to cross definite drainages where winter roads are to be used for several years.
- Construct water crossings on winter roads using drainage structures to minimize sediment load from the area.

7) Silvicultural/logging BMP contact in the State Forester's office:

Environmental Forestry Program Leader
Michigan Department of Natural Resources
Forest, Mineral and Fire Management Division
P.O. Box 30452
Lansing, MI 48909-7952
Phone: 517-335-3351
FAX: 517-373-2443
Web site: www.michigan.gov/dnr

Sources:

Hausler, R. 2002. Michigan Department of Natural Resources; Forest, Mineral and Fire Management Division. Personal e-mail. 6 November.

Michigan Department of Natural Resources. 1994. Water Quality Management Practices on Forest Land.

Minnesota

1) State agencies that have legislative authority for enforcing water pollution laws:

Staff Engineer
Minnesota Pollution
Control Agency
520 Lafayette Road
St. Paul, MN 55155-4194
Phone: 651-296-6300
Toll free phone: 800-657-3864
Web site: www.pca.state.mn.us

Water Management Administrator
Minnesota Department of Natural Resources
Division of Waters
500 Lafayette Road
St. Paul, MN 55155-4040
Phone: 651-296-4800
Toll free phone: 888-646-6367
E-mail: info@dnr.state.mn.us
Web site: www.dnr.state.mn.us/waters

2) A formal permit may be required to cross perennial streams.

If it is a protected water body by State definition, then it requires a permit. If the stream is not protected, then a permit is not required.

Protected waters include both perennial and intermittent streams, lakes, and open water wetlands. Not all such water bodies are protected. Most protected water bodies are included in the National Wetlands Inventory. Maps are available that identify the majority of protected waters. However, some, particularly tributaries to trout streams, may not yet be identified on a map.

Exemptions are provided for the following conditions.

Temporary Bridges (on streams only)
No permit is required as long as *all* of the following conditions are met:

- The streambank can support a bridge without pilings, foundations, culverts, excavation, or other special site preparations.
- Nothing is placed in the bed of the stream.
- The bridge is capable of removal for maintenance and flood damage prevention.
- The bridge is firmly anchored at one end and can swing away during flooding.
- A minimum 3 feet of clearance exists between the lowest portion of the bridge and normal summer streamflow.
- The structure is consistent with flood plain, shoreland, and wild, scenic, or recreational river ordinances.

For Streams With a Watershed Less Than 5 Square Miles (3,200 acres)
No permit is required to construct a bridge or culvert, or to fill or excavate the bed of a protected watercourse having a total drainage area, at its mouth, of 5 square miles or less, provided that all of the following conditions are met:

- County zoning officials and local soil and water conservation district staff are given at least 7 days prior notice and determine the project will not result in downstream erosion or sedimentation.
- The project will not divert the water to a different watershed.
- The project will not impound water by damming the watercourse.
- The watercourse is not an officially designated trout stream (or designated trout stream tributary).

Removal of Existing Structures
No permit is required as long as all of the following conditions are met:

- The original lake, marsh, or streambed is restored.
- All parts of the structure, including footings or pilings, are removed.
- The structure is not a water-level control device and is not in an officially designated trout stream (or designated trout stream tributary).

Contact a Soil and Water Conservation District (SWCD) office or DNR hydrologist to determine whether the proposed road will cross water or wetland designated on the Protected Waters Inventory maps. If so, secure the required permit from the DNR Division of Waters to work in public waters (Minn. Statute 103G.245).

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mostly voluntary.

Some situations, such as the silvicultural exemption for roads under the Federal Clean Water Act or the Minnesota Wetland Conservation Act, require adhering to the guidelines to qualify for the exemption. Local shoreland protection ordinances also make abiding by portions of the guidelines mandatory. Furthermore, those guidelines included in a forest management contract, such as a timber sale, become mandatory.

6) BMPs that pertain to portable bridge stream crossings:

Water crossings present a high risk to water quality and should be avoided when practical. Bridges or culverts are preferred for road crossings that are used frequently or for extended periods.

1. Minimize the number of water crossings.
2. Give preference to crossing locations where:
    - Streambed and banks are composed of firm, cohesive soils or rock.
    - Approaches to streambanks have low-percent slopes and slope lengths.
    - Construction will disrupt a minimum amount of natural stream channel.

3. Maintain crossings as close to a 90-degree angle as possible to the streambed.
4. Construct crossings so as not to change the cross-sectional area of the stream channel or impede fish migration.
5. Minimize construction disturbance to the natural flow of water.
6. Restrict activity in the water to periods of low flow.
7. Design culverts and bridges for minimal impact on water quality.
8. When installing culverts and bridges, make sure that materials used within the stream are clean, nonerodible, and nontoxic to aquatic life. Such materials include compacted fill, riprap, concrete, and treated timbers. When using chemically treated timber below or near the water level, it should be reasonably dry and free of excessive surface oils when installed.
9. Anchor temporary structures at one end to allow the structure to move aside during high waterflows.
10. Remove temporary fills and structures to the extent practical when use is complete.

7) Incentives for using portable bridges during harvesting activities:

No permit is required for streams crossed with temporary bridges, provided that certain conditions are met. See permit guidelines above.

8) Silvicultural/logging BMP contact in the State Forester's office:

BMP Program Coordinator
Minnesota Department of Natural Resources
Division of Forestry
500 Lafayette Road
St. Paul, MN 55155-4044
Phone: 651-296-6502
FAX: 651-296-5954
Web site: www.dnr.state.mn.us/forestry

Sources:

Dahlman, R. 2002. Minnesota Department of Natural Resources. Personal e-mail. 30 September.

Minnesota Forest Resources Council. 1999. Sustaining Minnesota Forest Resources: Voluntary Site-Level Forest Management Guidelines for Landowners, Loggers, and Resource Managers.

Mississippi

1) State agency that has legislative authority for enforcing water pollution laws:

Mississippi Department of Environmental Quality
2380 Highway 80 West
Southport Center
Jackson, MS 39204
Phone: 601-961-5002
Toll Free Phone: 888-786-0661
FAX: 601-354-6965
Web site: www.deq.state.ms.us

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

State law does not require the use of BMPs. Federal law exempts silvicultural harvesting in wetlands from the 404 permitting process, *provided* that State BMP guidelines are followed. Even though BMPs are not required by State law, their use is strongly encouraged by the Mississippi Department of Environmental Quality, the Mississippi Forestry Commission, the Mississippi Forestry Association, and the Mississippi Loggers Association. The Mississippi Forestry Commission requires all applicable BMPs to be used during harvesting that it oversees. All members of the American Forest & Paper Association (AF&PA) have agreed to abide by Sustainable Forestry Initiative (SFI) requirements, which require the use of all applicable BMPs on their harvesting operations.

If there are water quality problems resulting from a logging operation (i.e., large amounts of sediments discharged into streams or timber debris blocking streamflow), the State can and does require cleanup as well as the possibility of fines. This is done under Mississippi's general water quality law, which states that one shall not pollute State waters or degrade their quality by placing wastes in or near to waters. Mississippi also has a law against blocking flowing streams with timber debris.

6) BMPs that pertain to portable bridge stream crossings:

Bridges should be used over larger streams where heavy or long-term traffic is expected.

Temporary Stream Crossings

The crossing of streams by roads, skid trails, or firebreaks should be avoided. If stream crossings are unavoidable, minimize the number of crossings, cross the stream in the least disruptive manner possible, and control sediment. Protect water quality by maintaining the integrity of the streambank, using fill materials that are easy to remove in the restoration process and minimizing the amount of fill dirt entering the stream.

Temporary crossings should be constructed using the following recommendations:

- Cross streams at right angles.
- Approach streams at gentle slopes.
- If possible, use temporary bridges or portable logging mats (wood or steel dragline mats) rather than culverts.
- Stabilize approaches during and after construction.
- When logging is complete, remove all temporary fill material and restore the channel to its original elevation.

7) Silvicultural/logging BMP contact in the State Forester's office:

Resource Analysis Assistant
Mississippi Forestry Commission
301 North Lamar
Suite 300
Jackson, MS 39201
Phone: 601-359-1812
FAX: 601-359-1349
Web site: www.mfc.state.ms.us

Sources:

MacLellan, J. 2002. Mississippi Department of Environmental Quality. Personal e-mail. 2 October.

Mississippi Forestry Commission. 2000. Mississippi's Best Management Practices Handbook.

Sampson, M. 2002. Mississippi Forestry Commission. Personal e-mail. 24 September.

Missouri

1) State agency that has legislative authority for enforcing water pollution laws:

Section Chief
Missouri Department of Natural Resources
Environmental Quality Division
Water Pollution Control Program
205 Jefferson Street
Jefferson City, MO 65102
Toll Free Phone: 1-800-361-4827
FAX: 573-751-9396
Web site: www.dnr.state.mo.us/homednr.htm

2) A formal permit may be required to cross perennial streams.

If the bridge will cause the placement of fill material below the ordinary high-water mark of the stream or will involve any manipulation of the stream to redirect the flow, a 404 permit from the U.S. Army Corps of Engineers and a 401 Water Quality Certification from the State are required. In addition, any bridge approaches that may impact jurisdictional wetlands have to meet the same 404/401 requirements.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Plan the location of roads to minimize the number of stream crossings.
- Locate crossings at right angles to the stream channel and where the bottom is hard and relatively level.
- All approaches to stream crossings, whether on temporary or permanent roads, should be made at gentle grades.
- Soil around culverts, bridges, and crossings should be stabilized with coarse rock or large stones.
- Avoid temporary crossings of logs and brush topped with soil.
- Avoid any practice that would alter the flow of stream water.

7) Silvicultural/logging BMP contact in the State Forester's office:

Staff Supervisor
Missouri Department of Conservation
P.O. Box 180
Jefferson City, MO 65102
Phone: 573-751-4115 ext. 3304
FAX: 573-526-6670
Web site: www.conservation.state.mo.us

Sources:

Boos, D. 2002. Missouri Department of Natural Resources. Personal e-mail. 5 November.

Missouri Department of Conservation. 1997. Missouri Watershed Protection Practice.

Montana

1) State agencies that have legislative authority for enforcing water pollution laws:

Administrator
Montana Department of Environmental Quality
Water Protection Bureau
P.O. Box 200901
Helena, MT 59620
Phone: 406-444-3080
FAX: 406-444-6836
Web site: www.deq.state.mt.us

Service Forestry Bureau Chief
Montana Department of Natural Resources and Conservation
Forestry Division
2705 Spurgin Road
Missoula, MT 59804
Phone: 406-542-4326
General phone: 406-542-4300
FAX: 406-542-4217
Web site: www.dnrc.state.mt.us/forestry

The Department of Natural Resources and Conservation only has authority for enforcing Stream Management Zone laws, which only pertain to timber sales. The Department of Environmental Quality is the water quality enforcement agency.

2) A formal permit is required to cross perennial streams.

Legal Requirements
Under the Natural Streambed and Land Preservation Act of 1975 (the "310 law"), any activity that would result in physical alteration or modification of a perennial stream, its bed, or immediate banks must be approved in advance by the supervisors of the local conservation district.

Before beginning such a project, the operator must submit a permit application to the conservation district indicating the location, description, and project plans.

Whether temporary or permanent, any stream crossing on a perennial stream requires a 310 permit. Conservation districts are responsible for issuing 310 permits.

Stream-crossing projects initiated by Federal, State, or local agencies are subject to approval under the "124 permit" process (administered by the Department of Fish, Wildlife and Parks) rather than the 310 permit.

A 318 permit may be required unless waived by the Department of Fish, Wildlife and Parks as a condition of a 310 or 124 permit. The 318 permit authorizes a short-term water quality standard for turbidity for construction activity in State waters. Contact the Department of Environmental Quality for 318 authorizations and additional information.

3) A formal permit may be required to cross intermittent streams.

A 318 permit authorization may be needed to cross an intermittent stream if construction activity happens during flowing water and causes it to become turbid.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Minimize the number of stream crossings and choose stable stream-crossing sites.
- Design stream crossings for adequate passage of fish (if present), minimum impact on water quality, and at a minimum, the 25-year frequency runoff.
- Cross streams at right angles to the main channel if practical. Adjust the road grade to avoid the concentration of road drainage in stream crossings. Direct drainage flows away from the stream-crossing site or into an adequate filter.
- Minimize stream channel disturbances and related sediment problems during construction of roads and installation of stream-crossing structures. Do not place erodible material into stream channels. Remove stockpiled material from high-water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.
- Route road drainage through adequate filtration zones or other sediment-settling structures to ensure sediment does not reach surface water. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.

7) Silvicultural/logging BMP contact in the State Forester's office:

Service Forestry Bureau Chief
Montana Department of Natural Resources and Conservation
Division of Forestry
2705 Spurgin Road
Missoula, MT 59804
Phone: 406-542-4326
General Phone: 406-542-4300
FAX: 406-542-4217
Web site: www.dnrc.state.mt.us/forestry

Sources:

Ethridge, R. 2002. Montana Department of Natural Resources and Conservation, Division of Forestry. Personal e-mail. 31 October.

Montana State University Extension Service. 2001. Water Quality BMPs for Montana Forests.

Ryan, J. 2002. Montana Department of Environmental Quality, Permitting and Compliance Division, Water Protection Bureau. Personal e-mail. 9 December.

Nebraska

1) State agency that has legislative authority for enforcing water pollution laws:

Supervisor of Water Quality Assessment Section
Nebraska Department of Environmental Quality (DEQ)
Water Quality Assessment Section
P.O. Box 98922
Lincoln, NE 68509
Phone: 402-471-4227
General Phone: 402-471-4700
FAX: 402-471-2909
Web site: www.ndeq.state.ne.us

2) A formal permit may be required to cross perennial streams.

In accordance with Section 404 of the Clean Water Act, the U.S. Army Corps of Engineers issues either a nationwide or general permit. Issuance of a permit depends on how the operation will be conducted. Section 401 Certification is to assure that the practice would comply with Water Quality Standards.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Bridges should be designed to minimize impacts on streams.
- Excavation and reshaping of streambanks should be minimized and crossings should be installed at right angles to the stream channel to minimize disturbance.
- Bridge construction requires professional design and construction and special permits may be required as well.
- Bridge crossings should be slightly higher than approaches to prevent drainage water from exiting the roadway at the edge of the bridge and washing directly into the stream.

7) Silvicultural/logging BMP contact in the State Forester's office:

Rural Forestry Program Leader
Nebraska Forest Service
109 Plant Industry Building
East Campus UNL
Lincoln, NE 68583
Phone: 402-472-5822
FAX: 402-472-2964
Web site: www.nfs.unl.edu

Source:

Nebraska Forest Service. 2000. Forestry Best Management Practices for Nebraska.

Nevada

1) State agencies that have legislative authority for enforcing water pollution laws:

Resource Program Coordinator
Nevada Department of Conservation and Natural Resources
Division of Forestry
2525 South Carson Street
Carson City, NV 89701
Phone: 775-684-2507
General Phone: 775-684-2500
FAX: 775-687-4244
Web site: www.forestry.state.nv.us

Permits Officer
Nevada Department of Conservation and Natural Resources
Division of Environmental Protection
Bureau of Water Quality
333 West Nye Lane
Carson City, NV 89706
Phone: 775-687-9432
General Phone: 775-687-4670
FAX: 775-687-468
Web site: www.ndep.state.nv.us

2) A formal permit is required to cross perennial streams.

Application is made through the Division of Forestry, in consultation with the Division of Wildlife and the State Engineer, and considers the extent to which such requested activity is consistent with good forestry management for the harvesting of timber; the extent to which such requested activity significantly impedes or interrupts the natural flow and volume of water; the extent to which such requested activity significantly affects a continuation of the natural quality of the water pursuant to State and Federal water quality standards; the extent to which such requested activity is consistent with the prevention of significant soil erosion; the extent to which such requested activity may significantly obstruct fish and passage, cause sedimentation in fish spawning areas, infringe on feeding and nursing areas, and cause variations of water temperatures; and the filtration of sediment-laden water as a consequence of timber harvesting on adjacent slopes.

3) A formal permit may be required to cross intermittent streams.

A site visit by Division of Forestry personnel will determine, on a case-by-case basis, if a formal permit is required, if mitigation measures should be included in the harvest plan, or if no special action is necessary.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- When logging skid trails must cross a live stream, a prepared crossing shall be used.
- The timber operator shall not use the beds of streams as landings, roads, or skid trails, except at prepared crossings.
- At all road crossings of live streams, install suitable structures of sufficient size to allow for the full surface flow of the stream throughout the entire period of timber operations. All structures shall be placed to allow unrestricted fish passage.
- All temporary stream-crossing structures not designed for the normal maximum flow of the stream shall be removed upon completion of logging.

7) Silvicultural/logging BMP contact in the State Forester's office:

Resource Program Coordinator
Nevada Department of Conservation and Natural Resources
Division of Forestry
2525 South Carson Street
Carson City, NV 89701
Phone: 775-684-2507
General Phone: 775-684-2500
FAX: 775-687-4244
Web site: www.forestry.state.nv.us

Sources:

Harvey, R. 2002. Nevada Department of Conservation and Natural Resources, Division of Forestry. Personal e-mail. 26 September.

Mulligan, I. 2002. Nevada Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Water Pollution Control. Personal e-mail. 10 September.

Nevada State Conservation Commission. 1994. Handbook of Best Management Practices.

New Hampshire

1) State agencies that have legislative authority for enforcing water pollution laws:

New Hampshire Department of Environmental Services
6 Hazen Drive
P.O. Box 95
Concord, NH 03302
Phone: 603-271-3503
Web site: www.des.state.nh.us

Enforcement Inspector
Wetlands Bureau
Phone: 603-271-2147
FAX: 603-271-6588

Director
Water Division
Phone: 603-271-3503
FAX: 603-271-2982

The Department of Environmental Services has a memorandum of agreement with the Department of Resources and Economic Development – Division of Forests and Lands to enforce the wetlands laws in the course of enforcing their laws and rules.

2) A formal permit is required to cross perennial streams.

Timber harvests that involve stream or wetland crossings require a wetlands permit. The level of harvesting impacts on wetlands dictates the type of wetland permit required. There are three types of impacts: minimum, minor, and major.

To obtain a minimum impact wetlands permit (more of a notification), a *Notification of Forest Management or Timber Harvest Activities Having Minimum Wetlands Impact* form must be filled out by the landowner and sent to the Department of Environmental Services. The types of stream and wetlands crossings proposed need to be identified in the materials submitted with the notification. This form may only be used if all of the following criteria are met.

1. The land is not being cleared in preparation for subdivision, development, or conversion to nonforestry use.
2. The proposed activity is not in bogs, marshes, sand dunes, tidal wetlands, undisturbed tidal buffer zones, a wetland identified by the Natural Heritage Inventory, or in or adjacent to designated prime wetlands.
3. The width of the roadway travel surface at the crossing is not more than 20 feet (from edge of road to edge of road).
4. The fill width is not more than 50 feet from toe of slope to toe of slope.
5. The length of any forested wetland or wet meadow crossing (measured along the proposed access way) is not more than 50 feet.
6. The length of any surface water crossing (measured from base of bank to base of bank) is not more than 10 feet.

7. The wetlands that are being crossed do not have standing water for more than 2 months of the year.
8. During the installation of a bridge, none of the proposed work is in the water.
9. For bridge installations, the fill for abutment(s) does not exceed 3,000 square feet in the banks of the stream.
10. For installation of a temporary road through forested wetlands during frozen conditions, constructed of snow or inverted stumps, the road travel surface must not be more than 15 feet wide or 200 feet long.

If the timber harvest exceeds minimum impact, then a Dredge and Fill permit (RSA 482) or an Alteration of Terrain permit (RSA 485) is required.

3) A formal permit is required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Keep the number of stream crossings to a minimum.
- Install bridges at right angles to the stream. A maximum 15-degree skew may be allowed as an exception where approach conditions are difficult.
- Align approach and exit with the bridge's centerline with as little curvature as possible.
- Stream alignment should be straight at the point of crossing and of uniform profile.
- The minimum acceptable bridge width is 10 feet.
- Firmly anchor abutments out of the water in stable bank material and parallel to the stream channel. Do not narrow the stream channel with abutments.
- Acceptable abutment materials include rock, logs, sawtimbers, or a combination of any of the above.
- Place abutment aprons or approaches as close to the gradient of the bridge surface as possible. Avoid abrupt rises and drops from the bridge gradient to the apron gradient.
- Stringer material may be logs, sawn timbers, or steel.
- Match centerline gradients of the span and stringers with that of the road or trail.
- It is recommended that a registered engineer be contacted to design the bridge.
- Log stringers should have a flat upper-bearing face to accept a plank deck as well as a flat bearing surface on abutments. The placement of log stringers on abutments should alternate small and large ends.
- Deck material shall be placed perpendicular to the stringer direction and be tight.
- A curb shall be installed along the outer sides of the deck and be fastened tight to the deck. The minimum size will be 6 inches by 6 inches and will run the entire length of the span. Pole timbers can also be used, but must be straight and of sound quality.

- The bridge must be anchored so that it will not wash out during high water.
- Placement of bridges that requires work in the stream should be done when the water level is low and in as short a period of time as possible. This requires the filing of a regular permit application.
- Do not gravel the deck. The gravel holds moisture that will cause the deck to rot.
- When the harvesting operation has been completed, stabilize the area by removing all bridges from truck haul roads and skid trails that will not be maintained.
- Road and trail grades approaching stream crossings shall be broken and surface water dispersed so it will not reach the watercourse.
- Find streambanks that are firm and level and approaches that are reasonably level for a distance of 50 feet on each side of the stream crossing.
- Use grate or stone at the entrance and exit of the bridge to intercept sedimentation and mud from the road surface.

7) Silvicultural/logging BMP contact in the State Forester's office:

Administrator of Community Forestry
New Hampshire Division of Forests and Lands
P.O. Box 1856
Concord, NH 03302
Phone: 603-271-3457
FAX: 603-271-2629
Web site: www.nhdfl.org

Sources:

Crystall, S. 2002. New Hampshire Department of Environmental Services, Wetlands Bureau. Personal e-mail. 10 September.

Cullen, J.B. 2002. New Hampshire Department of Resources and Economic Development. Personal e-mail. 1 September.

New Hampshire Department of Resources and Economic Development, Division of Forests and Lands, Forest Information and Planning Bureau. 2001. Best Management Practices for Erosion Control on Timber Harvesting Operations in New Hampshire.

New Jersey

1) State agency that has legislative authority for enforcing water pollution laws:

Principal Environmental Engineer
New Jersey Department of Environmental Protection (DEP)
Land Use Regulation, Compliance and Enforcement
P.O. Box 439
501 East State Street
Trenton, NJ 08625-0439
Phone: 609-292-0060
FAX: 609-292-8115
Web site: www.state.nj.us/dep

2) A formal permit may be required to cross perennial streams.

A stream encroachment permit is required for all streams with watersheds greater than 50 acres above the crossing. If the stream has a drainage area of less than 50 acres at the stream crossing, a stream encroachment permit is not required, although a freshwater wetlands permit will be required.

For temporary crossings, the Department of Environmental Protection may issue a letter of no jurisdiction rather than a permit.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Stabilize streambanks at crossings during and after harvesting. Seeding, hay or straw, riprap, filter fabric, or mulching can be used to help stabilize streambanks.
- Approach a stream crossing perpendicular to the stream. Construct bridges at points of a stream where the water channel runs straight.
- Plan stream crossings at the narrowest section of a watercourse. Do not impede waterflow with any stream crossings.
- Use a crossing site with gentle slopes leading to low, stable banks and a firm stream bottom.
- To help ensure the least disturbance to the streambank, construct stream-crossing structures or temporary bridges with the structural capacity to safely handle expected vehicle loads and traffic volume.

- Use culverts or bridges where an unstable stream bottom would be damaged.
- Do not disturb the spawning or migration movements of aquatic species when constructing a stream crossing. For streams that are used for fish migration or spawning areas, bridges or arch culverts are preferred over pipe culverts.
- Temporary bridges are recommended for small stream crossings on temporary access roads.
- Stabilize soil around bridges. Seeding, mulching, riprap, filter fabric, or large stones are recommended for use around bridges to help prevent erosion.
- When installing or constructing bridges, follow recognized and approved installation and construction methods. Information on these methods can be obtained from the USDA Natural Resources Conservation Service and from the Society of American Foresters Forestry Handbook.

7) Incentive for using portable bridges for harvesting activities:

If a temporary portable bridge is used, a stream crossing or stream encroachment permit is not needed.

8) Silvicultural/logging BMP contact in the State Forester's office:

Supervising Forester
New Jersey Department of Environmental Protection
Division of Parks and Forestry
Forest Service
P.O. Box 404
Trenton, NJ 08625
Phone: 609-984-3860
FAX: 609-984-0378
Web site: www.nj.gov/dep/parksandforests/forest

Sources:

Contois, D. 2002. New Jersey Department of Environmental Protection, Land Use Regulation, Compliance and Enforcement. Personal e-mail. 12 December.

New Jersey Bureau of Forest Management. 1995. New Jersey Forestry and Wetlands Best Management Practices Manual.

New Mexico

1) State agency that has legislative authority for enforcing water pollution laws:

New Mexico Environment Department
1190 St. Francis Drive
P.O. Box 26110
Santa Fe, NM 87502
Phone: 505-827-2850
FAX: 505-827-2836
Web site: www.nmenv.state.nm.us

2) A formal permit is required to cross perennial streams.

Authorization is required from the U.S. Army Corps of Engineers and the New Mexico Environment Department when fill material will be placed in waters of the U.S. in New Mexico, which includes wetlands, lakes, streams, etc. In the case of streams, the jurisdictional limit is the ordinary high-water mark of a channel. The U.S. Army Corps of Engineers reviews projects for authorization under section 404 of the Clean Water Act, while the Surface Water Quality Bureau (SWQB) reviews projects for compliance with the State water quality standards pursuant to Section 401 of the Clean Water Act. Most road-crossing projects fall under the nationwide 404 Permit 14; projects involving perennial streams require a review period of up to 60 days for water quality certification from the SWQB.

3) A formal permit is required to cross intermittent streams.

The same process described above for perennial streams applies to intermittent streams, which are distinguished from ephemeral streams by the presence of ground water inputs. Ephemeral streams flow only in direct response to rainfall, and projects authorized by nationwide permits in ephemeral channels do not require a review period from the SWQB.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Bridges should be used for stream crossings instead of culverts wherever possible.
- When a stream crossing is necessary, locate the site on a stable, straight portion of the stream. The approach to the crossing should be at a minimal grade and at a right angle to the stream.
- Debris in stream channels that is added during construction shall be removed, but natural materials may be used as part of a sediment-control structure.
- Keep machinery out of streams except when absolutely necessary for culvert installation and bridge construction.

- Organic debris and surplus soil and rock shall be deposited where runoff will not be carried into a lake or watercourse.
- Bridges are required where drainage structures cannot carry the waterflow.
- Divert road drainage before all stream crossings. A cross drain should be installed up grade, on both sides of a stream crossing. Care must be taken to disperse the discharge from these cross drains through vegetation in order to protect streams and prevent the erosion of fill material.
- Remove stream-crossing structures on roads to be permanently closed.

Requirements for Streamside Management Areas

- No new roads shall be constructed within a streamside management area unless the permittee shows that it is technically or economically infeasible to construct the road elsewhere or that the damage to the environment would be greater if the road was elsewhere. When the division approves construction of a new road within a streamside management area, in addition to other requirements in subsection F of 19.20.4.9 NMAC, stream crossings shall be limited to those that are essential, crossings shall be at right angles to the main channel, and the approach to the crossing shall be at minimal grade.

7) Silvicultural/logging BMP contact in the State Forester's office:

State Timber Management Officer
P.O. Box 1948
Santa Fe, NM 87504
Phone: 505-476-3335
FAX: 505-476-3330
Web site: www.emnrd.state.nm.us/forestry

Sources:

Guevara, D. 2003. New Mexico Environment Department, Surface Water Quality Bureau, Watershed Protection Section, 401 Certification Program. Personal e-mail. 5 September.

New Mexico State Forestry. 2002. New Mexico Forest Practices Guidelines.

New York

1) State agency that has legislative authority for enforcing water pollution laws:

Private Land Services
New York State Department of Environmental Conservation
Regional Office; Lands and Forest
625 Broadway
Albany, NY 12233
Phone: 518-402-9425
FAX: 518-402-9028
Web site: www.dec.state.ny.us

There are nine regions that deal with enforcement in their respective counties. These regions and counties are listed below.

Region 1
Nassau and Suffolk Counties
SUNY - Building 40
Stony Brook, NY 11790
Phone: 631-444-0345
FAX: 631-444-0349

Region 2
Bronx, Kings, New York,
Queens, and Richmond Counties
1 Hunter's Point Plaza
47-40 21st Street
Long Island City, NY 11101-5407
Phone: 718-482-4900
FAX: 718-482-4997

Region 3
Dutchess, Orange, Putnam, Rockland,
Sullivan, Ulster, and Westchester Counties
21 South Putt Corners Road
New Paltz, NY 12561-1696
Phone: 845-256-3000
FAX: 845-255-3042

Region 4
Albany, Columbia, Delaware, Greene,
Montgomery, Otsego, Rensselaer,
Schenectady, and Schoharie Counties
Environmental Permits
1150 N. Westcott Road
Schenectady, NY 12306-2014
Phone: 518-357-2234
FAX: 518-357-2087

Region 5
Clinton, Franklin, Essex, Hamilton, Fulton, Saratoga,
Warren, and Washington Counties
Route 86, P.O. Box 296
Ray Brook, NY 12977-0296
Phone: 518-897-1200

Region 6
Herkimer, Jefferson, Lewis, Oneida, and
St. Lawrence Counties
317 Washington St.
Watertown, NY 13601
Phone: 315-785-2239
FAX: 315-785-2242

Region 7
Broome, Cayuga, Chenango, Cortland, Onondaga,
Oswego, Madison, Tioga, and Tompkins Counties
615 Erie Blvd. West
Syracuse, NY 13204-2400
Phone: 315-426-7400
FAX: 315-426-7408

Region 8
Chemung, Genesee, Livingston, Monroe, Ontario,
Orleans, Schuyler, Seneca, Steuben, Wayne, and
Yates Counties
6274 E. Avon-Lima Road
Avon, NY 14414-9519
Phone: 585-226-2466
FAX: 585-226-2830

Region 9
Niagara, Erie, Wyoming, Chautauqua,
Cattaraugus, and Allegany Counties
270 Michigan Avenue
Buffalo, NY 14203-2999
Phone: 716-851-7000

2) A formal permit may be required to cross perennial streams.

A permit is required to disturb the bed or banks of protected streams. This includes the installation of a ford, culvert, or bridge. Crossings requiring a permit may be subject to different standards and seasonal restrictions. An expedited permit process for logging is available for crossings that will be active for less than 1 year. If there is a question about classifications or standards, contact the nearest Department of Environmental Conservation (DEC) office.

3) A formal permit may be required to cross intermittent streams.

Some perennial streams may dry up and some intermittent streams may be protected and need a permit to cross. Before crossing any stream, call the local office to check stream classifications.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Use stream crossings only when absolutely necessary.
- Keep the number of stream crossings to a minimum.
- Cross streams by the most direct route.
- Find crossing sites that have low, stable banks, a firm stream bottom, minimal surface runoff, and gentle slopes along the approaches whenever possible.
- Stabilize the soil around bridges immediately after installation.
- As roads approach a stream crossing, proper road drainage is critical to avoid sedimentation in streams.
- Stream crossings should be designed, constructed, and maintained to safely handle expected vehicle loads and to minimize disturbance of streambanks, channels, and ultimately, aquatic organisms.
- Consider stream materials, stream size, storm frequency, flow rates, intensity of use (permanent or temporary), and the passage of fish when planning crossings.
- Design, construct, and maintain stream crossings to avoid disrupting the migration or movement of fish and other aquatic life.
- Install stream crossings using materials that are clean, nonerodible, and nontoxic to aquatic life.
- Install stream-crossing structures at right angles to the stream channel.
- Minimize channel changes and the amount of excavation or fill needed at the crossing by selecting locations where the water channel is straight and unobstructed.

- Bridges that are too small can plug up with debris and result in the road washing out or in flooding upstream. Crossings requiring a permit may be subject to different standards. Check with the local DEC office.
- Limit construction activity in the water to periods of low or normal flow.
- Keep use of equipment in the stream to a minimum.
- Use soil-stabilization practices on exposed soil at stream crossings. Use seed and mulch and install temporary sediment-control structures, such as straw bales or silt fences, immediately following construction to minimize erosion into streams. Maintain these practices until the soil is permanently stabilized.
- Stabilize approaches with aggregate or other suitable material to reduce sediment entering the stream.
- Anchor temporary structures on one end with a cable or other device so they do not float away during high water. Install them so they can be easily removed when no longer used, regardless of the season.
- Keep bridges clear and free of debris so that water can pass unimpeded at all times. This is especially important in areas where beaver are present.
- Portable bridges are recommended for unmaintained roads or skid trails. They are easily installed and cost effective.

7) Incentives for using portable bridges during harvesting activities:

If working in the NYC watershed, contact the NYC Watershed Agricultural Council (WAC) at 33195 State Highway 10, Walton, NY 13856-9751 (Phone: 607-865-7790, FAX: 607-865-4932, Web site: www.nycwatershed.org). Bridges can be rented for a low cost or loaned from the WAC.

8) Silvicultural/logging BMP contact in the State Forester's office:

Senior Forester
New York State Department of Environmental Conservation
Public Lands, Floor 5
625 Broadway
Albany, NY 12233-4255
Phone: 518-402-9425
FAX: 518-402-9028
E-mail: daschmid@gw.dec.state.ny.us
Web site: www.dec.state.ny.us

Sources:

New York State Forestry. 2000. Best Management Practices for Water Quality Field Manual.

Pogue, M. 2002. New York Department of Environmental Conservation. Personal e-mail. 23 December.

North Carolina

1) State agencies that have legislative authority for enforcing water pollution laws:

The Division of Forest Resources (DFR) is the lead agency for assurance that forestry operations are conducted such that they do not violate the Forest Practices Guidelines Related to Water Quality (FPGs). The FPGs are nine mandatory performance standards that must be met by all forestry land-disturbing activities for the activity to remain exempt from the permitting requirements of the State's Sedimentation Pollution Control Act (SPCA). The DFR works with involved parties to bring sites into compliance when they initially are not. When the DFR cannot get the involved parties to bring a site into compliance, the site is referred to the appropriate regulatory agency for enforcement action. The Division of Land Resources (DLR) has legislative responsibility for enforcement of water quality violations occurring as a result of sedimentation. The Division of Water Quality (DWQ) has responsibility for enforcement of water quality violations from other pollutants such as temperature, turbidity, nutrients, etc.

Staff Forester for Water Quality and Wetlands
North Carolina Department of Environment and Natural Resources
Division of Forest Resources
1616 Mail Service Center
Raleigh, NC 27699-1616
Phone: 919-733-2162 ext. 255
FAX: 919-715-5247
Web site: www.dfr.state.nc.us

Division of Water Quality
North Carolina Department of Environment and Natural Resources
1617 Mail Service Center
Raleigh, NC 27699-1617

Street Address
512 N. Salisbury Street
Raleigh, NC 27604
Phone: 919-733-7015
FAX: 919-733-9919
Web site: http://h2o.enr.state.nc.us

Chief, Land Quality Section
North Carolina Department of Environment and Natural Resources
Division of Land Resources
Land Quality Section
1612 Mail Service Center
Raleigh, NC 27699

Street Address
512 N. Salisbury Street
Raleigh, NC 27604
Phone: 919-733-4574
FAX: 919-733-2876
Web site: www.dlr.enr.state.nc.us/eros.html

2) **A formal permit is not required to cross perennial streams.**

3) **A formal permit is not required to cross intermittent streams.**

4) **There are BMPs for forestry practices.**

5) **The use of BMPs is voluntary.**

However, compliance with the FPGs is mandatory. Compliance is achieved through the use of BMPs or other equally effective measures.

6) **BMPs that pertain to portable bridge stream crossings:**

The nine Forest Practices Guidelines (FPGs) Related to Water Quality that are mandatory and are met through the use of BMPs are summarized as dealing with:

1. Streamside management zone
2. Prohibition of debris entering streams and water bodies
3. Access road and skid trail stream crossings
4. Access road entrances
5. Prohibition of waste entering streams, water bodies, and ground water
6. Pesticide application
7. Fertilizer application
8. Stream temperature
9. Rehabilitation of project sites

For the purpose of this publication, the FPGs directly related to stream crossings are the only ones listed.

Prohibition of Debris Entering Streams and Water Bodies
Avoiding stream obstruction and the impediment of streamflow and/or keeping debris from construction, harvesting, mill site residue, and site preparation out of intermittent and perennial streams and perennial water bodies shall prevent degradation of water quality.

Access Road and Skid Trail Stream Crossings
Stream crossings shall be avoided when possible. Access roads and skid trails that must cross intermittent streams are to be constructed so as to minimize the amount of sediment that enters the stream because of construction. These crossings shall be installed so that:

1. Streamflow will not be obstructed or impeded.
2. No stream channel or perennial water body shall be used as an access road or skid trail.
3. Crossings are provided with effective structures or ground cover to protect the banks and channel from accelerated erosion.
4. There shall be sufficient water-control devices to collect and divert surface flow from the access road or skid trail into undisturbed areas or other control structures to restrain accelerated erosion and prevent visible sediment from entering intermittent and perennial streams.
5. Ground cover, or other means, sufficient to prevent visible sediment from entering intermittent and perennial streams and perennial water bodies shall be provided within 10 working days of initial disturbance and will be maintained until the site is permanently stabilized.

Rehabilitation of Project Sites

Areas on the project site that have the potential for accelerated erosion, resulting in concentrated flow directly entering an intermittent or perennial stream or perennial water body, shall be provided with ground cover or other means of adequate sedimentation control within 30 working days after ceasing any phase of an operation or beginning a period of inactivity. Treatment and maintenance of these areas shall be sufficient to restrain accelerated erosion and prevent visible sediment from entering intermittent and perennial streams and perennial water bodies until the site is permanently stabilized.

7) Incentives for using portable bridges during harvesting practices:

To encourage loggers to utilize dragline mats as portable bridges, the DFR has purchased sets of three mats using Section 319 funds. The mats are located at 6 of 13 DFR district offices. They are available for use by loggers on a first-come, first-served basis. Loggers not using portable bridges are encouraged to borrow them to see first hand their utility, prior to buying or building their own.

8) Silvicultural/logging BMP contact in the State Forester's office:

Staff Forester for Water Quality and Wetlands
North Carolina Department of Environment and Natural Resources
Division of Forest Resources
1616 Mail Service Center
Raleigh, NC 27699-1616
Phone: 919-733-2162 ext. 255
FAX: 919-715-5247
Web site: www.dfr.state.nc.us

Sources:

Gueth, M. 2002. North Carolina Department of Environment and Natural Resources, Division of Forest Resources. Personal e-mail. 13 November.

North Carolina Department of Environment and Natural Resources, Division of Forest Resources. 1989. Forest Practices Guidelines Related to Water Quality.

North Dakota

1) State agency that has legislative authority for enforcing water pollution laws:

North Dakota Health Department
1200 Missouri Avenue
Bismarck, ND 58502
Phone: 701-328-5210
FAX: 701-328-5200
Web site: www.health.state.nd.us

2) A formal permit is not required to cross perennial streams.

Contact and coordinate with the local water resource district if there are plans to cross any stream. This includes both temporary and permanent crossings.

If filling or dredging is conducted during the operation, the Health Department would become involved due to Section 404 of the Clean Water Act.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Design stream crossings to minimize streambank and streambed disturbance.
- Cross streams at right angles to the main channel, if practical. Adjust the road grade to reduce the concentration of water carried through the drainage system to stream crossings. Direct drainage through the Riparian Management Zone (RMZ) and away from the stream-crossing site.
- Minimize stream channel disturbances and related sediment problems during construction of roads and installation of stream-crossing structures.
- Do not place erodible material into stream channels. Remove stockpiled material from high-water zones. Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance. Time construction activities to protect fisheries and water quality.
- Prevent plunge pool and downstream erosion from high-velocity discharges.
- Designate or mark all stream courses, including small streams, and existing culvert locations prior to snowfall. Conduct activities in streamside zones so the ground disturbance is minimized. Following completion of snow road use, restore stream crossings to near pre-road conditions to prevent ice dams. Do not use the stream channel for the roadway except for crossings.

7) Silvicultural/logging BMP contact in the State Forester's office:

Staff Forester
North Dakota Forest Service
Molberg Forestry Center
307 First Street East
Bottineau, ND 58318
Phone: 701-228-5483
FAX: 701-228-5448
Web site: www.ndsu.nodak.edu/ndsu/lbakken/forest/NDFSHome.htm

Source:

North Dakota Forest Service. 1999. North Dakota Forestry Best Management Practices.

Ohio

1) State agency that has legislative authority for enforcing water pollution laws:

Ohio Department of Natural Resources
Division of Soil and Water Conservation
4383 Fountain Square Drive
Building B-3
Columbus, OH 43224
Phone: 614-265-6610
FAX: 614-262-2064
Web site: www.dnr.state.oh.us/soilandwater

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs/Specifications that pertain to portable bridge stream crossings:

BMPs (Ohio Department of Natural Resources, Division of Forestry)

- Construct small bridges or install culverts at live stream crossings and seeps (springs).
- Cross streams at a right angle if possible.
- Roads leading down to a stream crossing should be drained so that water will not run down the road into the stream.
- If a bridge is used to cross a stream, streambanks will be least disturbed if bridge abutments are left intact when a bridge is removed.

Specifications (Ohio Department of Natural Resources, Division of Soil and Water Conservation)

- Stream crossings should be made perpendicular to the channel to minimize the length of channel disturbed. Crossings deviating up to 30 degrees from perpendicular are acceptable.
- Stream crossings shall be made as narrow as practical to minimize the length of channel disturbed. More importantly, the length of the streambank cleared or otherwise disturbed for the stream crossing shall be made as narrow as practical.
- Stream crossings shall not cause sudden changes in stream elevation, drops, or waterfalls, which could create a barrier to migrating fish.
- The access road approaching the stream crossing shall not route sediment-laden runoff directly to the stream. At a minimum distance of 50 feet from the stream, runoff shall be diverted with water bars or swales to an adequate sediment-trapping practice.

- To minimize obstructions and barriers, all temporary bridges, culverts, gabions, and other structures must be removed as soon as the crossing is no longer needed. However, clean stone and rock is usually best left in the channel because removing it causes more of a disturbance and leaving it may actually be environmentally beneficial. Stone and rock left in the channel must be formed so that it does not impede fish passage. The streambanks must be stabilized.

Specifications for a Temporary Access Bridge

- Stream Disturbance – Disturbance to the stream shall be kept to a minimum. Streambank vegetation shall be preserved to the maximum extent practical and the stream crossing shall be as narrow as practical.
- Clearing shall be done by cutting NOT grubbing. The roots and stumps shall be left in place to help stabilize the banks and accelerate revegetation.
- Water shall be prevented from flowing along the road directly to the stream. Diversions and swales shall direct runoff away from the access road to a sediment-control practice.
- Bridges shall be constructed to span the entire channel. If the channel width exceeds 8 feet as measured from the top-of-bank, then a footing, pier, or bridge support may be constructed within the waterway. No more than one additional footing, pier, or bridge support shall be permitted for each additional 8-foot width of the channel. However, no footing, pier, or bridge support will be permitted within the channel for waterways less than 8 feet wide.
- No fill other than clean stone free from soil shall be placed within the stream channel.

7) Silvicultural/logging BMP contact in the State Forester's office:

Administrator, Forest Industries Program
Ohio Department of Natural Resources
Division of Forestry
1855 Fountain Square Court
Building H-1
Columbus, OH 43224-1327
Phone: 614-265-6690
FAX: 614-447-9231
Web site: www.ohiodnr.com/forestry

Sources:

Ohio Department of Natural Resources, Division of Forestry. 1992. BMPs for Erosion Control on Logging Jobs in Ohio.

Ohio Department of Natural Resources, Division of Soil and Water Conservation. 1996. Rainwater and Land Development: Ohio's Standards for Stormwater Management Land Development and Urban Stream Protection. Second Edition.

Oklahoma

1) State agency that has legislative authority for enforcing water pollution laws:

Water Quality Division Director
Department of Environmental Quality
707 North Robinson
Oklahoma City, OK 73102
Phone: 405-702-8100
FAX: 405-702-6101
Web site: www.deq.state.ok.us

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

The following guidelines are intended for crossing small streams that flow only during part of the year or minor hillside channels that carry water only during rainstorms.

- Avoid logging during wet periods.
- Use cross drains and turnouts to remove water from road surfaces and ditches before reaching stream crossings.
- Minimize stream crossings by good road planning. Follow the forest management plan.
- Always cross streams at right angles.
- When logging requires the construction or repair of crossings on major streams, use the following guidelines:
  - Use bridges or culverts where a ford or crossing cannot be found that would minimize rutting or siltation.
  - Construct low-water bridges and overflow culverts to cause no more than minimal changes in natural streambeds during high-water periods.
  - Low-water bridge fills and earth embankments constructed for use as bridge approaches should be protected from erosion by high water. Methods of protection may include use of rocky fill material, planted or seeded ground cover, rock riprap, concrete surfacing, and retaining walls or bulkheads.
  - If slash or debris from road operations is deposited in a stream channel, it should be removed prior to removal of equipment from the area.
  - Bridges should not constrict clearly defined stream channels. Permanent bridges should be designed to pass the normal flood level, or else the road approach should be

constructed to provide erosion protection from overflow floodwaters that exceed the water-carrying capacity of the drainage structure.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Water Quality Specialist
Oklahoma Department of Agriculture, Food and Forestry
Forestry Services Division
P.O. Box 528804
Oklahoma City, OK 73152
Phone: 405-522-6158
FAX: 405-522-4583
Web site: www.oda.state.ok.us

Sources:

Cooperative Extension Service, Division of Agriculture Sciences and Natural Resources, Oklahoma State University. 1992. Report #5: Best Management Practices for Forest Road Construction and Harvesting Operations in Oklahoma.

Oklahoma Department of Agriculture, Forestry Services. 1991. Forestry Best Management Practice Guidelines for Water Quality Management in Oklahoma.

Oregon

1) State agencies that have legislative authority for enforcing water pollution laws:

Lead Agency
Oregon Department of Environmental Quality (DEQ)
Water Quality Division
811 SW Sixth Avenue
Portland, OR 97204
Phone: 503-229-5279
FAX: 503-229-6124
Web site: www.deq.state.or.us/wq

Enforcement of BMPs on NonFederal Forest Lands
Oregon Department of Forestry (ODF)
Forest Practices Program
2600 State Street
Salem, OR 97310
Phone: 503-945-7470
FAX: 503-945-7490
Web site: www.odf.state.or.us

2) A formal permit is not required to cross perennial streams.

Anyone who conducts a forest operation, including forest road construction, must notify the Department of Forestry at least 15 days prior to activity. Written plans are required for any operations within 100 feet of fish-bearing or domestic-use streams. Written plans must show in detail how the operation will be conducted to comply with applicable rules. Operations may not begin until the written plan is approved.

3) A formal permit is not required to cross intermittent streams.

Same process as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

Oregon BMPs that address stream crossings are called Forest Practice Administrative Rules, as summarized below.

Stream-Crossing Structures

1. Minimize the number of stream crossings.
2. Cross streams at right angles where feasible.
3. Design and construct stream-crossing structures (culverts, bridges, and fords) to:
   (a) Minimize excavation of side slopes near the channel.
   (b) Minimize the volume of material in the fill.
      - Minimizing fill material is accomplished by restricting the width and height of the fill to the amount needed for safe use of the road by vehicles, and by providing adequate cover over the culvert or other drainage structure.

   Fills over 15 feet deep contain a large volume of material that can be a considerable risk to downstream beneficial uses if the material moves downstream by water. Written plans are required for all streams and must show that the design minimizes the likelihood of surface erosion, embankment failure, and other downstream movement of fill material.

   (c) Prevent erosion of the fill and channel.

4. Design and construct stream crossings (culverts, bridges, and fords) to:
   (a) Pass a peak flow that at least corresponds to the 50-year return interval without ponding of water higher than the top of the culvert; and
   (b) Allow migration of adult and juvenile fish upstream and downstream during conditions when fish movement in that stream normally occurs.

5. An exception to these is allowed to reduce the height of fills where roads cross flood plains if:
   (a) The stream-crossing site includes a wide flood plain;
   (b) The stream-crossing structure matches the size of the active channel and is covered by the minimum fill necessary to protect the structure;
   (c) Except for culvert cover, soil fill is not placed in the flood plain; and
   (d) The downstream edge of all fill is armored with rock of sufficient size and depth to protect the fill from eroding when a floodflow occurs.

Stream Protection

1. When constructing stream crossings, minimize disturbance to banks, existing channels, and riparian management areas (including leave trees).
2. Keep machine activity in beds of streams to an absolute minimum. Acceptable activities where machines are allowed in streambeds, such as installing culverts, shall be restricted to periods of low water levels.
3. Install water-crossing structures where needed to maintain the flow of water and passage of adult and juvenile fish between side channels or wetlands and main channels.
4. Leave or reestablish areas of vegetation between roads and waters of the State to protect water quality.
5. Remove temporary stream-crossing structures promptly after use, and construct effective sediment barriers at approaches to channels.

7) Silvicultural/logging BMP contact in the State Forester's office:

Oregon Department of Forestry
Forest Practices Program
2600 State Street
Salem, OR 97310
Phone: 503-945-7481 or 503-945-7487
FAX: 503-945-7490
Web site: www.odf.state.or.us

Source:

Oregon Department of Forestry, Forest Practice Administrative Rules, Division 625 – Road Construction and Maintenance, Division 635 and 640 – Riparian Management Areas.

Pennsylvania

1) State agency that has legislative authority for enforcing water pollution laws:

Pennsylvania Department of Environmental Protection
Office of Water Management
16th Floor, Rachel Carson State Office Building
P.O. Box 2063
Harrisburg, PA 17105-2063
Phone: 717-787-4686
Web site: www.dep.state.pa.us

The Department of Environmental Protection is responsible for enforcing water pollution laws and regulations in Pennsylvania. In addition, county conservation districts have been delegated to administrate and enforce the requirements found in State erosion and sediment control regulations, and process general permits required for stream obstructions or encroachments.

2) A formal permit may be required to cross perennial streams.

All stream crossings in Pennsylvania require either a permit or a waiver-of-permit from the conservation district or the appropriate DEP regional office and, in some cases, the conservation district. Permit requirements may be waived for crossings where the drainage area is less than 100 acres. Stream-crossing structures intended to remain permanently require a detailed, site-specific design.

Crossings that will be used no longer than 1 year on nonpublic roads can be permitted through General Permit-8 (GP-8). This permit allows stream crossings using a culvert, bridge, or ford. The purpose of the permit is to facilitate completion of temporary projects, such as a timber harvest that can be completed in 1 year or less. Information and applications for GP-8 may be obtained from any conservation district office. There is no cost for registering the GP-8.

Most logging road stream crossings are exempt from permitting under Federal Section 404 (U.S. Army Corps of Engineers) because they are classified as "minor road crossing fills." To gain this exemption, the following four conditions must be met:

1. Fill actually placed into a stream channel cannot exceed 200 cubic yards.
2. The stream must be properly bridged (must pass expected high flows).
3. Wetlands must not be affected.
4. All other best management practices must be followed.

The U.S. Army Corps of Engineers and the Pennsylvania DEP, Bureau of Watershed Management, have a joint permit application process. One application is submitted for both Federal and State permits. Since the responsibilities of these two agencies overlap to a great degree, their compliance activities complement each other.

Establishing contact with the Pennsylvania DEP, Bureau of Watershed Management, will ensure that the timber harvester is advised on the applicability of Section 404 to a particular stream-crossing situation.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) Erosion and sediment control BMPs are required.

Timber harvesters must comply with the requirements of Chapter 102 related to Erosion and Sediment Control when constructing roads, landing areas, skid roads, and conducting other disturbance activities.

6) BMPs that pertain to portable bridge stream crossings:

- Bridges and culverts are the preferred methods of crossing intermittent and perennial streams.
- Roads should cross all watercourses at a right angle to the stream or wetlands.
- Maintain all stream approaches in a firm and stable condition. Stream-crossing approaches should not exceed 10 percent slope within 50 feet of the crossing.
- Avoid wetlands and stream crossings through known rare, threatened and endangered species habitat, and through headwaters of public water supplies.
- Avoid road construction through wild trout streams during spawning season.

In addition, timber harvesters must comply with the requirements of Chapter 105 related to Water Obstructions and Encroachments and with the requirements of Chapter 102.

7) Silvicultural/logging BMP contact:

Chief
Pennsylvania Department of Conservation and Natural Resources (DCNR)
Bureau of Forestry
Rural and Community Forestry Section
6th Floor, Rachel Carson State Office Building
P.O. Box 8552
Harrisburg, PA 17105-8552
Phone: 717-787-6460
FAX: 717-783-5109
Web site: www.dcnr.state.pa.us/forestry/index.htm

Silvicultural/logging BMP contact in the DEP:

Chief, Technical Services Section
Pennsylvania Department of Environmental Protection
Division of Waterways, Wetlands and Erosion Control
10th Floor, Rachel Carson State Office Building
P.O. Box 8775
Harrisburg, PA 17105-8775
Phone: 717-787-6827
FAX: 717-772-5986
Web site: www.dep.state.pa.us

Sources:

Brown, D. 1993. Best Management Practices for Silvicultural Activities in Pennsylvania's Forest Wetlands: A Pocket Guide for Foresters, Loggers, and Other Forest Land Managers. Forested Wetlands Task Force, Forest Issues Working Group.

Chunko, S.E. and W.E. Wolf. 1999. Best Management Practices for Pennsylvania Forests. Penn State, College of Agricultural Sciences.

Murin, K. 2003. Division of Waterways, Wetlands and Erosion Control. Personal e-mail. 7 January.

Pennsylvania Department of Environmental Protection, Bureau of Water Quality Protection. 1999. Controlling Erosion and Sediment from Timber Harvesting Operations.

Rhode Island

1) **State agency that has legislative authority for enforcing water pollution laws:**

   Rhode Island Department of Environmental Management
   Office of Compliance and Inspection
   235 Promenade Street
   Providence, RI 02908-5767
   Phone: 401-222-1360
   FAX: 401-222-3811
   Web site: www.state.ri.us/dem

2) **A formal permit is required to cross perennial streams.**

   The Department of Environmental Management can approve temporary stream crossings if the stream is less than 10 feet in width. Crossing a stream greater than 10 feet in width requires the approval of the Rhode Island Division of Forest Environment and review by the Division of Freshwater Wetlands.

   Contact the Division of Forest Environment before installing any stream crossing to receive approval and/or technical assistance.

3) **A formal permit is not required to cross intermittent streams**, but a Notification of Intent to Saw or Cut must be filed with the Division of Forest Environment.

4) **There are BMPs for forestry practices.**

5) **The use of BMPs is mandatory** when related to water quality protection issues.

6) **BMPs that pertain to portable bridge stream crossings:**

   Crossing streams should be avoided whenever possible.

   Streams less than 10 feet in width can be crossed without a wetlands permit as long as the following BMPs are followed:

   - If possible, use existing bridges or culverts for crossing.
   - All crossings should be made in a manner that will cause the least amount of disturbance. The site of the crossing should be selected where the stream is narrow and banks and streambeds are stable.
   - The approach to the stream should be located on slopes less than 10 percent. Crossings should be made at 90 degrees to the stream (right angles).
   - The trails approaching and leaving the riparian area along the streambank should be well planned and maintained.

- Hay mulch or wood residues can be used to temporarily stabilize the disturbed area during a harvesting operation. Permanent vegetative cover should be reestablished on disturbed areas as soon as possible.
- Hay bales or silt fence should be installed downstream from the crossing to limit excessive amounts of debris from entering the main watercourse.
- Debris resulting from logging operations must be removed from streams as soon as possible.

7) Silvicultural/logging BMP contact in the State Forester's office:

Principal Forester and Service Forester
Rhode Island Department of Environmental Management and
Division of Forest Environment
260 Acadia Road
Oak Valley, RI 02832
Phone: 401-539-2356
FAX: 401-539-1157
Web site: www.state.ri.us/dem

Source:

Cassidy, G.J., J.B. Aron, and M.J. Tremblay. 1996. Best Management Practices for Rhode Island: Water Quality Protection and Forest Management Guidelines. Rhode Island Division of Forest Environment.

South Carolina

1) State agency that has legislative authority for enforcing water pollution laws:

Watershed Manager
South Carolina Department of Health and Environmental Control
2600 Bull Street
Columbia, SC 29201
Phone: 803-898-4142
General Phone: 803-898-3432
FAX: 803-898-4140
Web site: www.scdhec.net

2) A formal permit may be required to cross perennial streams.

A formal permit is not required unless it is State navigable water. Many streams are not considered State navigable waters.

Bridge construction across navigable waterways is under the jurisdiction of the South Carolina Department of Health and Environmental Control (DHEC). Permanent bridges (those that would remain in place for a period greater than 6 months) must meet higher standards than temporary bridges. Anyone planning to construct a bridge across a navigable waterway must contact the DHEC for permit application forms and technical design information.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Cross streams at right angles except where prevented by geologic features.
- Keep approaches to stream crossings to as gentle a slope as practical.
- Use drainage structures, such as water turnouts or broad-based dips, on both sides of a crossing as needed to prevent road and ditch runoff from entering the stream.
- Stabilize disturbed soil around crossings soon after construction.
- Use a licensed forester or other qualified professional to locate stream crossings prior to road construction to minimize impacts.
- Consider using portable bridges instead of culverts.
- Avoid allowing runoff from roadside ditches to flow directly into streams at crossings.
- Avoid altering the flow of the stream.

7) Silvicultural/logging BMP contact in the State Forester's office:

Environmental Management Section Chief
South Carolina Forestry Commission
P.O. Box 21707
Columbia, SC 29221
Phone: 803-896-8817
General Phone: 803-896-8800
FAX: 803-798-8097
Web site: www.state.sc.us/forest

Source:

South Carolina Forestry Commission Web site (www.state.sc.us/forest/rbsc.htm). Accessed September 2002.

South Dakota

1) State agency that has legislative authority for enforcing water pollution laws:

Program Administrator
South Dakota Department of Environment and Natural Resources
Surface Water Quality Program
Foss Building
523 East Capital Avenue
Pierre, SD 57501
Phone: 605-773-3351
FAX: 605-773-5286
Web site: www.state.sd.us/denr/denr.html

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

However, activities shall not cause a violation of instream water quality standards. If construction activities disturb 1 or more acres, a stormwater discharge permit and implementation of BMPs may be required.

6) BMPs that pertain to portable bridge stream crossings:

- Design stream crossings for adequate passage of fish, minimum impact on water quality, and ability to handle peak runoff and floodwaters.
- Cross streams at right angles to the main channel if practical.
- Adjust the road grade to reduce the concentration of water carried by drainage ditches to stream crossings.
- Direct drainage flows through a Streamside Management Zone (SMZ) and away from the stream-crossing site.
- Avoid unimproved stream crossings.
- Minimize stream channel disturbances and related sediment problems during construction of roads and installation of stream-crossing structures.
- Time construction activities to protect fisheries and water quality.
- Do not place erodible material into stream channels. Remove stockpiled material from high-water zones.
- Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance.

- Construction of stream crossings has the greatest potential to cause immediate sediment pollution. Complete the work as fast as possible during a time of year when the least damage can occur.

7) Silvicultural/logging BMP contact in the State Forester's office:

Stewardship Specialist
South Dakota Department of Agriculture
Division of Resource Conservation and Forestry
3305½ West South Street
Rapid City, SD 57702
Phone: 605-394-2279
FAX: 605-394-2549
Web site: www.state.sd.us/doa/forestry/index2.htm

Source:

South Dakota Department of Agriculture, Division of Forestry. 1994. Forestry BMPs: Forest Stewardship Guidelines for Water Quality.

Tennessee

1) State agency that has legislative authority for enforcing water pollution laws:

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
711 R.S. Gass Boulevard
Nashville, TN 37243
Phone: 615-687-7123
FAX: 615-687-7078
Web site: www.state.tn.us/environment/wpc

2) A formal permit may be required to cross perennial streams.

Any stream crossing over 25 feet wide does require a permit. Stream crossings for forestry and agricultural purposes are exempt.

3) A formal permit may be required to cross intermittent streams.

Same permit requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

Stream crossings should be made at right angles to the streambanks, should be located where stream channels are straight, and should not interfere with normal streamflow.

Approaches to stream crossings should climb away from streams to minimize erosion during high water and should be graveled to prevent washing and rutting. Dips and turnouts should be installed to turn water off roads before entering the stream.

<u>Stream Crossings in Stream Management Zones</u>

- Avoid stream crossings whenever possible to prevent disturbance of streambanks.
- Locate crossings where stream channels are straight.
- Stream crossings should be made at right angles to the streambanks.
- Build approaches to stream crossings where they climb away from streams.
- Install dips and turnouts to drain water off roads before entering streams.

Bridges should be used to cross streams that cannot be forded or that are too large to carry in culverts.

- Locate bridges at right angles to the stream where approaches are level.
- Construct bridge crossings where the stream channel is straight with an unobstructed flow of water.
- Place bridge abutments in a direction parallel to the streamflow and imbed in good foundation materials.

7) Silvicultural/logging BMP contact in the State Forester's office:

Water Quality Forester
Tennessee Department of Agriculture
Division of Forestry
2670 Highway 127 South
Crossville, TN 38572
Phone: 931-456-1905
FAX: 931-484-4227
Web site: www.state.tn.us/agriculture/forestry/index.html

Source:

Tennessee Department of Agriculture, Division of Forestry. 1993. Guide to Forestry Best Management Practices.

Texas

1) State agency that has legislative authority for enforcing water pollution laws:

Texas State Soil and Water Conservation Board
Agriculture and Silvicultural Non-point Source Pollution Abatement

Mailing Address
P.O. Box 658
Temple, TX 76503
Phone: 254-773-2250 or 800-792-3485
FAX: 254-773-3311
Web site: www.tsswcb.state.tx.us

Street Address
311 North 5th Street
Temple, TX 76501

2) A formal permit is not required to cross perennial streams.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

Permanent and Temporary Crossings
Cross at right angles. Do not allow wing ditches to dump into streams. Make sure they are stabilized and will not wash out.

- Minimize disturbance to streambanks.
- Do not use equipment in the streambed.
- Do not impede streamflow.
- Stream crossings should be constructed to minimize the disturbance to streambanks and existing stream channels. Temporary crossings should be removed and the site promptly restored.
- Use of equipment in the streambed should be kept to an absolute minimum.
- Low-water bridges, fills, and earth embankments used as bridge approaches should be stabilized to minimize potential erosion by using headwalls, wingwalls, riprap, surfacing, etc.
- Excess material and woody debris from road construction should be cleared from streams and drainageways and deposited above the ordinary high-water mark.
- Bridges should not constrict clearly defined stream channels nor unduly impede floodwaters.
- Aggregate or other suitable material should be laid on approaches to fords, bridges, and culvert crossings to ensure a stable roadbed approach and reduce sediment in the stream.

- When necessary, stabilize road surfaces and cut and fill slopes using effective erosion-control and water-control methods (i.e., seeding, commercial erosion-control materials, riprap, etc.).
- Stream crossings will require frequent inspections during operations to determine their functional and safe condition. When needed, corrective measures should be taken immediately to restore to full function.
- Remove culverts and bridges from temporary stream crossings upon completion of operations and return the crossing as closely as possible to its original condition.
- Bridges should be constructed with minimum disturbance to the streambank, channel, and adjacent Streamside Management Zone (SMZ).
- When necessary to protect approaches and roadbed fills near bridges, adequate erosion protection should be provided by headwalls, wingwalls, riprap, etc.
- The use of temporary bridges may be necessary to minimize streambank disturbances and provide a means of temporary access to critical areas when permanent structures are not warranted or needed.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Survey Program Coordinator
Texas Forest Service
P.O. Box 310
Lufkin, TX 75902-0310
Phone: 936-639-8180
FAX: 936-639-8185
Web site: http://txforestservice.tamu.edu

Source:

Texas Forestry Association. 2000. Texas Forestry Best Management Practices.

Utah

1) State agency that has legislative authority for enforcing water pollution laws:

Manager
Utah Department of Environmental Quality
Division of Water Quality
288 North 1460 West
Salt Lake City, UT 84116
Phone: 801-538-6146
FAX: 801-538-6016
Web site: www.waterquality.utah.gov

2) A formal permit is required to cross perennial streams.

The Utah State Engineer's office administers a Stream Alteration Program with the purpose of regulating activities affecting the bed or banks of natural streams. The State Engineer's working definition of a natural stream is any natural waterway in the State that has flows of sufficient duration to develop a characteristic ecosystem distinguishing it from the surrounding environment. Any individual planning an activity that will affect a natural stream must first obtain a Stream Alteration Permit from the Department of Natural Resources, Division of Water Rights. Most proposals reviewed by the State (for example, for bridge construction or pipeline installation) are covered by General Permit 40, which authorizes the State to have its Stream Alteration Permit fulfill the requirements of Section 404 of the Clean Water Act for most activities. General Permit 40 does not apply in some instances and a U.S. Army Corps of Engineers Individual Permit is required. Projects requiring this additional permit include those involving wetlands, threatened or endangered species, properties listed on the National Historic Register, stream relocation, or the pushing of streambed material against a streambank using a bulldozer or similar equipment.

3) A formal permit may be required to cross intermittent streams.

Based on permit process described above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

Any construction activities affecting the bed or banks of streams may require a permit from the Division of Water Rights. A Stream Alteration Permit is required before such work may begin. Contact the local office or the State office at 801-538-7375.

Stream Crossings

- Install crossings during the appropriate season to minimize effects on water quality.
- Consider low-flow periods and impact on fish populations.
- Identify the appropriate type of stream crossing.
- Install stream crossings appropriately.
- Protect the integrity of the existing stream channel.
- Place rock, gravel, slash, or other material along streamsides to protect the fill material and bridge abutments from erosion.

Select a site for a stream crossing before the road system is laid out or planned. This will allow the road system to be designed for the best approach to stream crossings. The profile of a streambed should not be changed when constructing crossings. Alteration of the streambanks should be minimized and a permit is required prior to any work being done. All stream crossings should be done at right angles to the stream channel to minimize disturbance to vegetation, banks, and streambed.

Bridges

- Use care to minimize disturbance to streambanks and approaches. A permit is required for any streambank alteration.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Stewardship Coordinator
Department of Natural Resources
Division of Forestry, Fire, and State Lands
1594 West North Temple
Suite 3520
Salt Lake City, UT 84114
Phone: 801-538-5457
FAX: 801-533-4111
Web site: www.ffsl.utah.gov

Sources:

Utah Department of Natural Resources. 2001. Utah's Forest Water Quality Guidelines: A Practical User's Guide for Landowners, Loggers & Resource Managers.

Utah Department of Natural Resources, Division of Water Rights Web site (www.waterrights.utah.gov/strmalt/default.htm). Accessed 12 December 2002.

Vermont

1) State agency that has legislative authority for enforcing water pollution laws:

Chief of Forest Management
Department of Forests, Parks, and Recreation
Agency of Natural Resources
103 South Main Street
Building 10 South
Waterbury, VT 05676
Phone: 802-241-3675
802-241-3678 (Forestry Division)
FAX: 802-244-1481
Web site: www.anr.state.vt.us

2) A formal permit may be required to cross perennial streams.

The issuance of a stream alteration permit depends on the size of the stream and the amount of disturbance that is going to occur. Contact the Department of Environmental Conservation for further details.

3) A formal permit may be required to cross intermittent streams.

See above.

4) There are Acceptable Management Practices (AMPs) for forestry practices.

Vermont has AMPs instead of BMPs.

5) The use of AMPs is mandatory.

6) Acceptable Management Practices that pertain to portable bridge stream crossings:

Truck road crossings of all permanent streams shall be over a bridge or culvert.

- Bridge crossings are preferable to culverts because there is less disturbance of the stream channel.
- Bridges prevent erosion and stream siltation and reduce the amount of gasoline, oil, and grease that are often washed off vehicles when crossing streams.
- Bridge design should be based on the size (acres) of the drainage area that it serves and should be able to handle the largest potential streamflows.
- Bridge crossings should be located where the stream channel is straight with an unobstructed flow of water.
- The roadway approaching the stream should be reasonably level for a distance of 50 feet on each side of a bridge.

Surface Water and Stream Crossings

- All nonpermanent structures shall be removed from streams and the channel restored.
- Streambanks shall be stabilized and seeded and mulched as soon as conditions are favorable for seed germination but no longer than 1 year after logging is completed.

7) Silvicultural/logging BMP contact in the State Forester's office:

Chief of Forest Management
Department of Forests, Parks, and Recreation
Agency of Natural Resources
103 South Main Street
Building 10 South
Waterbury, VT 05676
Phone: 802-241-3675
FAX: 802-244-1481
Web site: www.anr.state.vt.us

Source:

Department of Forests, Parks, and Recreation. 1997. Acceptable Management Practices for Maintaining Water Quality on Logging Jobs in Vermont.

Virginia

1) State agency that has legislative authority for enforcing water pollution laws:

Water Resources Program Manager
Virginia Department of Forestry
900 Natural Resources Drive
Suite 800
Charlottesville, VA 22903
Phone: 434-977-1375 ext. 3327
FAX: 804-296-2369
Web site: www.dof.state.va.us

2) A formal permit is required to cross perennial streams.

A formal permit is required if the stream drains an area greater than 5 square miles.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

Use of the State's BMPs allows the locality to provide an exemption for an operator from the criteria and guidelines mandated under the Chesapeake Bay Preservation Act. The Chesapeake Bay Preservation Act applies to the Coastal Plain areas that drain into the bay.

6) BMPs that pertain to portable bridge stream crossings:

Any skid trail that crosses a perennial or intermittent stream or a drainage ditch leading to a natural drainage should use an appropriately selected and installed stream crossing. **Logs should not be skidded through intermittent or perennial streams.**

Temporary Bridge Specifications

1. Temporary bridges should be installed at right angles to the stream.
2. The approaches should be stable. Stabilize if necessary with rock extending at least 50 feet from both sides of the stream edge. Underline rock with geotextile cloth where necessary.
3. Bridge approaches should be straight to limit safety hazards and prevent logs, soil, and other debris from being deposited into the stream by the sliding movement of logs over the edge of the bridge. Remove temporary bridges when logging is completed. Stabilize approaches and stream edges with vegetation if necessary to prevent soil delivery to the stream.

7) Silvicultural/logging BMP contact in the State Forester's office:

Water Resources Program Manager
Virginia Department of Forestry
900 Natural Resources Drive
Suite 800
Charlottesville, VA 22903
Phone: 434-977-1375 ext. 3327
FAX: 804-296-2369
Web site: www.dof.state.va.us

Source:

Virginia Department of Forestry. 2002. Best Management Practices (BMP) Guide.

Washington

1) State agency that has legislative authority for enforcing water pollution laws:

Timber, Fish and Wildlife Field Specialist
Department of Ecology
Southwest Regional Office
Water Quality
300 Desmond Drive
Lacey, WA 98503

Mailing Address
Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600
Phone: 360-407-7529
General Phone: 360-407-6000
FAX: 360-407-6426
Web site: www.ecy.wa.gov

2) A formal permit is required to cross perennial streams.

Hydraulic project approval (HPA) is required from the Washington Department of Fish and Wildlife (WDFW) regardless if the stream is perennial or intermittent. Whether this permit is issued or not depends on the project and its effect on fish usage. An HPA is also required for bridge painting and other maintenance where there is the potential for wastage of paint, sandblasting material, sediments, or bridge parts to enter the water, or where the work, including equipment operation, occurs waterward of the ordinary high-water line. Exemptions and 5-year permits will be considered if an applicant submits a plan to adhere to practices that meet or exceed the provisions otherwise required by the department.

3) A formal permit is required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary, unless they are a condition of the HPA.

6) BMPs/Forest Practices Rules that pertain to portable bridge stream crossings:

Best Management Practices (BMPs)

Road Construction and Reconstruction BMPs

- Select a stream-crossing location to minimize the length of road that lies within the Riparian Management Zone (RMZ).
- Locate the road to reduce the number of water crossings that are necessary.
- Locate and install drainage structures upslope (upgrade) of stream crossings to minimize entry of ditch water and surface sediment into streams. Locate this drainage structure as close to the stream crossing as possible, while still allowing the outfall to deposit on stable portions of the forest floor and not continue directly into the stream system.
- Design and install culverts, or other appropriate crossing structures, at each location where the road crosses a natural drainage. Avoid redirecting natural drainage water into road ditches.
- All stream-crossing structures must be designed and installed to pass 100-year flood events. Replace nonfunctional stream-crossing structures with structures that will pass a 100-year flood event with consideration for the passage of debris likely to be encountered.
- All stream-crossing structures on fish-bearing streams must be designed and installed to pass all fish in all life stages.

Forest Practices Rules

Water Typing System (WAC 222-16-030)
The State's waters have been classified according to fish habitat water type for the purpose of regulation and use. The waters are classified using the following criteria:

Type S Water means all waters, within their bankfull width, inventoried as "shorelines of the State" under chapter 90.58 RCW and the rules promulgated pursuant to chapter 90.58 RCW, including periodically inundated areas of their associated wetlands.

Type F Water means segments of natural waters other than Type S Waters, which are within the bankfull widths of defined channels and periodically inundated areas of their associated wetlands, or within lakes, ponds, or impoundments having a surface area of 0.5 acre or greater at seasonal low water, and which in any case contain fish habitat or are described by one of the following four categories:

(a) Waters, which are diverted for domestic use by more than 10 residential or camping units or by a public accommodation facility licensed to serve more than 10 persons, where such diversion is determined by the department to be a valid appropriation of water and the only practical water source for such users. Such waters shall be considered to be Type F Water upstream from the point of such diversion for 1,500 feet or until the drainage area is reduced by 50 percent, whichever is less;

(b) Waters, which are diverted for use by Federal, State, tribal, or private fish hatcheries. Such waters shall be considered Type F Water upstream from the point of diversion for 1,500 feet, including tributaries if highly significant for protection of downstream water quality. The department may

allow additional harvest beyond the requirements of Type F Water designation provided the department determines, after a landowner-requested, on-site assessment by the Department of Fish and Wildlife, Department of Ecology, the affected tribes, and interested parties, that:

(i) The management practices proposed by the landowner will adequately protect water quality for the fish hatchery, and

(ii) Such additional harvest meets the requirements of the water type designation that would apply in the absence of the hatchery;

(c) Waters, which are within a Federal, State, local, or private campground having more than 10 camping units, provided that the water shall not be considered to enter a campground until it reaches the boundary of the park lands available for public use and comes within 100 feet of a camping unit, trail, or other park improvement; and

(d) Riverine ponds, wall-based channels, and other channel features that are used by fish for off-channel habitat. These areas are critical to the maintenance of optimum survival of fish. This habitat shall be identified based on the following criteria:

(i) The site must be connected to a fish habitat stream and accessible during some period of the year, and

(ii) The off-channel water must be accessible to fish.

Type Np Water means all segments of natural waters within the bankfull width of defined channels that are perennial, nonfish habitat streams. Perennial streams are waters that do not go dry any time of a year of normal rainfall. However, for the purpose of water typing, Type Np Waters include the intermittent dry portions of the perennial channel below the uppermost point of perennial flow. If the uppermost point of perennial flow cannot be identified with simple, nontechnical observations (see board manual, section 23), then Type Np Waters begin at a point along the channel where the contributing basin area is:

(a) At least 13 acres in the western Washington coastal zone,

(b) At least 52 acres in other locations in western Washington, and

(c) At least 300 acres in eastern Washington.

Type Ns Water means all segments of natural waters within the bankfull width of the defined channels that are not Type S, F, or Np Waters. These are seasonal, nonfish habitat streams in which surface flow is not present for at least some portion of a year of normal rainfall and that are not located downstream from any stream reach that is Type Np Water. Ns Waters must be physically connected by an aboveground channel system to Type S, F, or Np Waters.

<u>Road Location and Design</u> (WAC 222-24-020)

- Minimize the number of stream crossings.
- Where stream crossings are necessary:
  - Design stream crossings to minimize alterations to natural features.
  - Whenever practical, cross streams at right angles to the main channel.

Water-Crossing Structures (WAC 222-24-040)
In addition to the applicable general provisions below, installation, maintenance, and removal of water-crossing structures in or across the bankfill width of Type S or F Waters are subject to hydraulic code rules and require hydraulic project approval (HPA) issued by the Department of Fish and Wildlife. HPAs may be required on Type Ns and Np Waters.

- Alterations or disturbance of the streambed, bank, or bank vegetation must be limited to that necessary to construct the project. All disturbed areas must be stabilized and restored according to the recommended schedule and procedures found in Section 3 of the board manual. This requirement may be modified or waived by the department, in consultation with the Department of Fish and Wildlife, if precluded by engineering or safety factors.
- When earthen materials are used for bridge surfacing, only clean, sorted gravel may be used, a geotextile lining must be installed, and curbs of sufficient size shall be installed to a height above the surface material to prevent surface material from falling into the streambed.
- Wood removed from the upstream end of culverts and bridges will be placed at the downstream end of such culverts and bridges in such a way as to minimize obstruction of fish passage and, to the extent practical, while avoiding significant disturbance of sediment in connection with maintenance activities.
- Earthen embankments constructed for use as bridge approaches must be provided with sufficient erosion protection to withstand a 100-year flood event.

In addition to the applicable general provisions above, installation, maintenance, and removal of temporary bridges or other structures in or across Type Np and Ns Waters are subject to the following:

- A temporary water crossing is intended for use during the life of an approved application/ notification.
- It must be constructed to facilitate abandonment when the intended use is complete or upon seasonal shutdown, whichever is sooner.
- Temporary water crossings must be identified on the forest practices application or notification, along with an abandonment date.
- Temporary water crossings may be used:
  - In western Washington if installed after June 1 and removed by September 30 of the same year.
  - In eastern Washington if installed after spring runoff and removed prior to October 15th.
  - At other times, when the department and applicant can agree to specific dates of installation and removal and the extended dates result in equivalent levels of resource protection.
- Temporary water crossings must be designed to pass the highest peak flow event expected to occur during the length of its intended use.
- Temporary water crossings shall be promptly removed and abandoned to the specifications approved by the department upon completion of use or by the date specified in the approved forest practices application, whichever is earlier. Approaches to the crossing shall be water barred and stabilized at the time of the crossing removal.

- The department may waive removal of the water crossing if the applicant secures an amended forest practices application, and the structure and its approaches meet all of the requirements of a permanent water-crossing structure.
- Temporary wetland crossings shall be abandoned and restored based on a written plan approved by the department prior to construction.
- Temporary water crossings must be designed to provide the same level of protection for public resources as provided by rules during the length of its use.

Water-Crossing Structures (WAC-220-110-070)
In fish-bearing waters, bridges are preferred as water-crossing structures by the department in order to ensure free and unimpeded fish passage for adult and juvenile fishes and preserve spawning and rearing habitat. Pier placement waterward of the ordinary high-water line shall be avoided, where practicable. Other structures that may be approved, in descending order of preference, include: temporary culverts, bottomless arch culverts, arch culverts, and round culverts.

Water-crossing structure projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to water-crossing structures:

Bridge construction:

- Excavation for and placement of the foundation and superstructure shall be outside the ordinary high-water line unless the construction site is separated from waters of the State by use of an approved dike, cofferdam, or similar structure.
- The bridge structure or stringers shall be placed in a manner to minimize damage to the bed.
- Alteration or disturbance of bank or bank vegetation shall be limited to that necessary to construct the project. All disturbed areas shall be protected from erosion using vegetation or other means within 7 calendar days of completion of the project. The banks shall be revegetated within 1 year with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of 3 feet (on center) and maintained as necessary for 3 years to ensure 80 percent survival. Where proposed, planting densities and maintenance requirements for rooted stock will be determined on a site-specific basis. The requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude it.
- Removal of existing or temporary structures shall be accomplished so that the structure and associated material do not enter the watercourse.
- The bridge shall be constructed according to the approved design to pass the 100-year peak flow with consideration of debris likely to be encountered. Exceptions shall be granted if the applicant provides hydrologic or other information that supports alternative design criteria.
- Wastewater from project activities and water removed from within the work area shall be routed to an area landward of the ordinary high-water line to allow removal of fine sediment and other contaminants prior to being discharged into State waters.
- Structures containing concrete shall be sufficiently cured prior to contact with water to avoid leaching.

- Abutments, piers, piling, sills, approach fills, etc., shall not constrict the flow so as to cause any appreciable increase (not to exceed .2 feet) in backwater elevation (calculated at the 100-year flood) or channel-wide scour and shall be aligned to cause the least effect on the hydraulics of the watercourse.
- Riprap materials used for structure protection shall be angular rock and the placement shall be installed according to an approved design to withstand the 100-year peak flow.

7) Silvicultural/logging BMP contact in the State Forester's office:

NR Project Section Administrator for Silviculture
Washington State Department of Natural Resources
Land Management Division
P.O. Box 47016
Olympia, WA 98504-7016
Phone: 360-902-1346
General Phone: 360-902-1000
FAX: 360-902-1789
Web site: www.dnr.wa.gov

Sources:

Toal, Charles. 2002. Washington Department of Ecology. Personal e-mail. 10 December.

Washington State Department of Fish and Wildlife Web site (www.wa.gov/wdfw/hab/engineer/w2201170.htm). Accessed 4 April 2003.

Washington State Department of Natural Resources. 2001. Washington Forest Practices Board Manual.

Washington State Department of Natural Resources Web site (www.dnr.wa.gov). Forest Practices Rules: Title 222 WAC. Accessed 4 April 2003.

West Virginia

1) State agency that has legislative authority for enforcing water pollution laws:

Director
West Virginia Department of Environmental Protection
Division of Water and Waste Management
1201 Greenbrier Street
Charleston, WV 25311-1088
Phone: 304-558-2107
FAX: 304-558-5905
Web site: www.dep.state.wv.us

2) A formal permit is required to cross perennial streams.

A permit is required to cross all navigable streams. The permit is issued by the Department of Natural Resources, Public Lands Corporation.

3) A formal permit is not required to cross intermittent streams.

4) There are BMPs for forestry practices.

5) The use of BMPs is mandatory.

6) BMPs that pertain to portable bridge stream crossings:

- Streams should be crossed as close to a right angle to the stream as possible.
- Bridges or culverts should be sized so as not to impede streamflow in keeping with good drainage practices.
- Approaches to the stream should be graveled for a distance of 100 feet on each side.
- Road gradients approaching water crossings should be broken and surface water dispersed so it will not flow directly into the stream.
- If roads are to be used after logging, broad-based dips, culverts, and bridges should be left intact and periodically maintained by the landowner. If not used, drainage structures should be removed and road surfaces restored to a natural drainage by outsloping smoothly at 3 percent, leaving existing dips and establishing water bars.
- Streambanks will be least disturbed if bridge abutments are left intact when bridges are removed.

7) Silvicultural/logging BMP contact in the State Forester's office:

Assistant State Forester
West Virginia Bureau of Commerce
Division of Forestry

Logging and Water Quality
1900 Kanawha Blvd.
E. Charleston, WV 25305
Phone: 304-558-2788
FAX: 304-558-0143
Web site: www.wvforestry.com

Source:

West Virginia Division of Forestry. 2001. Best Management Practices for Controlling Soil Erosion and Sedimentation from Logging Operations in West Virginia.

Wisconsin

1) State agency that has legislative authority for enforcing water pollution laws:

Chief
Rivers and Habitat Protection Section
Wisconsin Department of Natural Resources
101 S. Webster Street
Madison, WI 53702
Phone: 608-264-8554
FAX: 608-266-2244
Web site: www.dnr.state.wi.us/org/water/fhp/waterway/index.htm

2) A formal permit may be required to cross perennial streams.

A Chapter 30 (Wisconsin State statute) permit is required to construct a ford or install a culvert or bridge across a navigable perennial or intermittent stream. A stream is navigable if it has a bed and banks, and it is possible to float a canoe or other small craft in the waterway on a regular, recurrent basis – even if only during spring runoff. Streams identified on current U.S. Geological Survey (USGS) topographical maps (7.5 minute/1:24,000 scale) should be considered navigable. When planning to construct a stream crossing, call a water management specialist at the Wisconsin Department of Natural Resources area office for information and to apply for a permit. For stream crossings that are not designed to pass the 100-year flood without causing backwater, obtain flooding easements from the affected upstream property owners.

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

- Use soil-stabilization practices on exposed soil at stream crossings. Use seed and mulch and install temporary sediment-control structures, such as straw bales or silt fences, immediately following construction to minimize erosion into streams. Maintain these practices until the soil is permanently stabilized.
- Design, construct, and maintain stream crossings to avoid disrupting the migration or movement of fish and other aquatic life. Bridges or arch culverts that retain the natural stream bottom and slope are preferred for this reason.
- Install stream crossings using materials that are clean, nonerodible, and nontoxic to aquatic life.

- Install stream-crossing structures at right angles to the stream channel.
- Minimize channel changes and the amount of excavation or fill needed at the crossing.
- Limit construction activity in the water to periods of low or normal flow. Keep use of equipment in the stream to a minimum.
- Construct a bridge or place fill directly over a culvert higher than the road approach to prevent surface road runoff from draining onto the crossing structure and into the stream.
- Divert road drainage into undisturbed vegetation, preferably outside the Riparian Management Zone (RMZ), so that the drainage does not directly enter the stream.
- Stabilize approaches to bridge, culvert, and ford crossings with aggregate or other suitable material to reduce sediment entering the stream.
- Anchor temporary structures on one end with a cable or other device so they do not float away during high water. Install them so they can be easily removed when no longer used, regardless of the season.

7) Silvicultural/logging BMP contact in the State Forester's office:

Forest Hydrologist
Wisconsin Department of Natural Resources
Division of Forestry
101 S. Webster Street
Madison, WI 53702
Phone: 608-266-1667
FAX: 608-266-8576
Web site: www.dnr.state.wi.us/org/land/forestry

Sources:

Gasser, D.H. 2002. Wisconsin Department of Natural Resources, Division of Forestry. Personal e-mail. 5 November.

Wisconsin Department of Natural Resources, Bureau of Forestry. 1995. Wisconsin's Forestry Best Management Practices for Water Quality: Field Manual for Loggers, Landowners and Land Managers.

Wyoming

1) State agency that has legislative authority for enforcing water pollution laws:

Administrator of Water Quality
Wyoming Department of Environmental Quality
Hershler Building
122 West 25th Street
Cheyenne, WY 82002
Phone: 307-777-7781
FAX: 307-777-6937
Web site: http://deq.state.wy.us

2) A formal permit may be required to cross perennial streams.

The U.S. Army Corps of Engineers decides if there needs to be a permit. The permitting process depends on the size and degree of impact.

U.S. Army Corps of Engineers
Wyoming Regulatory Office
2232 Dell Range Boulevard, Suite 210
Cheyenne, WY 82009-4942
Phone: 307-772-2300
FAX: 307-772-2920
Web site: www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm

3) A formal permit may be required to cross intermittent streams.

Same permit process and requirements as above.

4) There are BMPs for forestry practices.

5) The use of BMPs is voluntary.

6) BMPs that pertain to portable bridge stream crossings:

<u>Stream Channel Protection</u>

- The location and method of stream crossings will be decided in the project planning phase prior to commencement of the operation.
- The channel and streambanks should be returned to their original condition and stability or as close as practicable upon the completion of any construction activity.
- Operations should be conducted in such a way that debris does not enter the stream course. Any material that inadvertently or accidentally enters a stream course in an amount that adversely affects the natural flow, water quality, or fishery resource should be removed

immediately in a manner that causes the least disturbance.

- Wheeled or tracked laying equipment should not operate within the stream channel except for the purpose of constructing or maintaining bank-protection devices or stream crossings.
- Water bars and other erosion-control structures should be located to prevent water and sediment from being channeled into stream courses and to dissipate concentrated flows.
- Material removed from stream courses as a result of necessary construction will be moved to an upland area where it will not be washed back to the stream during runoff.
- Some construction activities involving the temporary placement of fill material below the normal high-water mark may require a permit from the U.S. Army Corps of Engineers. The Corps should always be consulted before an activity of this type.

General Guidelines for the Location and Design of Roads and Trails

Stream-crossing structures should be designed to provide the most efficient drainage facility consistent with resource protection. The design should involve a hydrologic analysis to determine runoff rates and volumes, flood conditions, velocities, scour, open channel shapes, approach topography, materials foundation conditions, and fish passage as required.

Stream Crossings on Temporary Roads

- Temporary bridges should be designed and installed to provide unobstructed streamflow and fish passage and to minimize damage to stream courses.
- The number of crossings should be kept to the minimum needed for access. Channel crossings should be as perpendicular to stream courses as possible. Streambank excavation should be kept to the minimum needed for the use of the crossings.
- Crossing facilities shall be removed when the facility has served its purpose and is no longer needed. Fills associated with these facilities shall also be removed to an upland disposal site. The stream channel and banks should also be returned to the original configuration, condition, and stability.

Bridge Installation (Disposition of Surplus Material and Protection of Fisheries)

Excavation in or near stream courses is a common requirement for the installation of bridges, culverts, and other streamside structures such as weirs, check dams, riprapping, or fish-passage structures. Surplus material should obstruct neither the stream course, including the flood plain, nor the efficiency of the associated structure. Preventive measures include:

- Diverting streamflow around construction sites during construction in order to minimize erosion and downstream sedimentation.
- Easily erodible material should not be deposited into live streams.
- Any material stockpiled on flood plains should be removed before rising waters reach the stockpiled material.
- During excavation in or near the stream course, it may be necessary to use suitable cofferdams, caissons, cribs, or sheep piling. This will usually be the case where ground water

is contributing a significant amount of water to the immediate excavation area. If any of the aforementioned devices are used, they should be practically watertight and no excavation should be made immediately outside of them. If water from the subsurface strata is not significant, pumping may be used, provided sediment from the pumped water can be disposed of where it will not reenter the stream during high flows.

- Water pumped from excavation should not be discharged directly into live streams, but should be pumped into settling ponds. Construction of these ponds will require a permit from the Department of Environmental Quality/Water Quality Division. Likewise, a National Pollutant Discharge Elimination System (NPDES) permit is also required if the sediment ponds are designed to have a discharge point.
- When needed, bypass roads should be located to have minimal disturbance on the stream course.
- Construction activity in or adjacent to the stream should be limited to specific times to protect beneficial water uses (e.g., fisheries).
- Operation of mechanical equipment in live streams should be kept to the amount necessary to avoid impacts on aquatic resources.

7) Silvicultural/logging BMP contact in the State Forester's office:

Assistant State Forester
Wyoming Office of State Lands and Investments
Division of Forestry
1100 West 22nd Street
Cheyenne, WY 82002
Phone: 307-777-5662
FAX: 307-777-5986
Web site: http://lands.state.wy.us

Sources:

Pickerd, H. 2002. Office of State Lands and Investments, Wyoming Division of Forestry. Personal e-mail. 1 October.

Wyoming Department of Environmental Quality. 1997. Silviculture Best Management Practices: Wyoming Nonpoint Source Management Plan.

APPENDIX C: Portable Timber Bridge Manufacturers

Big R Manufacturing and Distributing
P.O. Box 1290
Greeley, CO 80632-1290
Phone: 800-234-0734 or 970-356-9600
FAX: 970-356-9621
Email: bigrmfg@bigrmfg.com

Blue Ridge Pipe and Supply
P.O. Box 235
Glenwood, NC 28737
Phone: 800-738-8327
FAX: 828-738-4757

Carolina Mat Co.
Ken Trowbridge Rd.
P.O. Box 339
Plymouth, NC 27962
Phone: 800-624-6027 or
252-793-4045
FAX: 252-793-5187
Email: mats@clis.com
Web site: www.carolinamat.com

Clear Creek Crossings, LLC
2337 Stewartstown Road
Morgantown, WV 26508
Phone: 304-291-3962 or 304-276-0946
FAX: 304-291-3472

Continental Bridge
8301 State Highway 29N
Alexandria, MN 56308
Phone: 800-328-2047
FAX: 320-852-7067
Web site: www.continentalbridge.com

Dimension Lumber Company
Ceylon Putnam
85 Jug Hill Road
Livermore Falls, ME 04254
Phone: 207-897-9973
FAX: 207-897-9973 or 207-562-9216

Hopewell Hardwood Sales, Inc.
P.O. Box 781
Hopewell, VA 23860
FAX: 804-541-8849
Phone: 804-458-5178

Johnson Lumber Company, Inc.
Alan Johnson
11564 Longwoods Road
Easton, MD 21601
Phone: 410-822-5476
FAX: 410-820-4250

Nick's Bridges
2006 Augusta Road
Bowdoin, ME 04287
Phone: 207-837-9404
FAX: 207-666-8582

Permapost Products Co.
4066 SE Tualatin Valley Hwy.
P.O. Box 100
Hillsboro, OR 97123
Phone: 503-648-4156
Outside Oregon: 800-828-0222
FAX: 503-648-6383
Web site: www.permapost.com

Quality Mat Company
6550 Tram Road
Beaumont, TX 77713
Phone: 409-722-4594 or 800-227-8159
FAX: 409-892-6415
Email: qmat2000@aol.com
Web site: www.qmat.com

Rapid-Span Structures, LTD
1145 Industrial Drive
Armstrong, BC Canada V0E 1B6
USA/Canada: 800-661-2047
Phone: 250-546-9676
FAX: 250-546-9066
Web site: www.rapidspan.com

Richard West Co., Inc.
US Highway 64 West
P.O. Box 868
Plymouth, NC 27962
Phone: 252-793-4440
FAX: 252-793-6051

Sentinel Structures, Inc.
P.O. Box 128
477 S. Peck Ave.
Peshtigo, WI 54157
Phone: 715-582-4544
FAX: 715-582-4932
Email: engr@sentinelstructures.com
Web site: www.sentinelstructures.com

Structural Wood Systems
P.O. Box 250
Greenville, AL 36037
Phone: 334-382-6534
FAX: 334-382-4260
Web site: www.structuralwood.com

SureSpan USA, Inc.
Suite 216
545 Clyde Avenue
West Vancouver, BC Canada V7T 1C5
Phone: 604-925-3377
FAX: 604-925-3394
Email: bridges@surespan.com

Sustainable Forestry and Wood Products
Appalachian Sustainable Development
P.O. Box 791
Abingdon, VA 24212
Phone: 276-623-1121
FAX: 276-623-1353
Email: sfwp_asd@eva.org
Web site: www.appsusdev.org

T.E. Johnson Lumber Co.
3872 Old School Rd.
Four Oaks, NC 27524
Phone: 919-963-2233
FAX: 919-963-3049

Western Wood Structures, Inc.
P.O. Box 130
20675 SW 105th Street
Tualatin, OR 97062
Phone: 503-692-6900
FAX: 503-692-6434
Web site: www.westernwoodstructures.com

Wheeler Consolidated, Inc.
9330 James Avenue South
Bloomington, MN 55431
Phone: 800-328-3986
FAX: 952-929-2909
Email: info@wheeler-con.com
Web site: www.wheeler-con.com

Wicklifte Skid Co.
Highway 286 East
P.O. Box 426
Wicklifte, KY 42087
Phone: 270-335-3301
FAX: 270-335-3318
Email: wickskid@brtc.net
Web site: www.carolinamat.com

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